VMC Vidyamandir Classes SINCE 1986

IIT JEE | MEDICAL | FOUNDATION

CODE A

Mock JEE Main - 3 | JEE

Date: [redacted] Maximum Marks: 300

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 is a NUMERICAL VALUE. For each question, enter the correct numerical value of the answer. If the answer is a decimal numerical value, then round-off the value to TWO decimal places. If the answer is an Integer value, then do not add zero in the decimal places. (Example: 6, 81, 1.50, 3.25, 0.08)
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, 0 for all other cases. There is no negative marking.

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. $Y = 2A\cos^2(kx - \omega t)$ represents a wave with amplitude A´ and frequency *f*. The value of A´ and *f* are:

(A) $2A, \frac{\omega}{2\pi}$ **(B)** $A, \frac{\omega}{\pi}$ **(C)** $\sqrt{A}, \frac{\omega}{\pi}$ **(D)** $\sqrt{A}, \frac{\omega}{2\pi}$

2. Two identical pieces of ice fly towards each other with equal and opposite velocities and are converted into water upon impact. If their initial temperature is – 12°C, then the minimum possible velocity of either piece before impact is: $(S_{ice} = 0.50\ \text{cal gm}^{-1}{}^{\circ}\text{C}^{-1}, L_{ice} = 80.0\ \text{cal gm}^{-1}, 1\ \text{cal} = 4.2\text{J})$

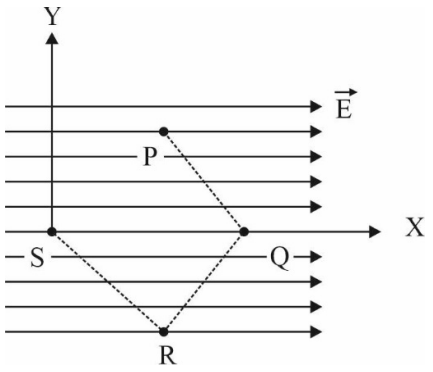
(A) 850 m/sec **(B)** 600 m/sec
(C) 1000 m/sec **(D)** 500 m/sec

3. Choose the option showing the correct match for work done by *n* moles of a diatomic ideal gas for ΔT change in temperature in different processes.

Column I		Column II	
P.	Isobaric Process	**I.**	$nR\frac{\Delta T}{2}$
Q.	Adiabatic Process	**II.**	$nR\Delta T$
R.	Process with $PV^2 = \text{constant}$	**III.**	$-nR\Delta T$
S.	Process with $\frac{P}{V} = \text{constant}$	**IV.**	$-\frac{5}{2}nR\Delta T$

(A) [P-II] [Q-III] [R-II] [S-III] **(B)** [P-II] [Q-IV] [R-III] [S-I]
(C) [P-III] [Q-IV] [R-II] [S-I] **(D)** [P-II] [Q-IV] [R-III] [S-II]

4. Point charge q moves from point P to point S along the path PQRS (figure shown) in a uniform electric field E pointing co-parallel to the positive direction of the x-axis. The coordinates of the points P, Q, R and S are (*a*, *b*, 0), (2*a*, 0, 0), (*a*, – *b*, 0) and (0, 0, 0) respectively. The work done by the field in the above process is given by the expression:



(A) qEa **(B)** $-qEa$ **(C)** $qEa\sqrt{2}$ **(D)** $qE\sqrt{\left[(2a)^2 + b^2\right]}$

5. The ratio of contributions made by the electric field and magnetic field components to the intensity of an EM wave is:

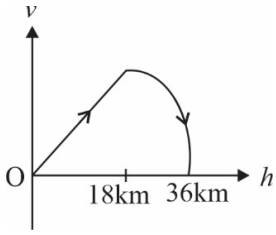
(A) $c : 1$ **(B)** $c^2 : 1$ **(C)** $1 : 1$ **(D)** $\sqrt{c} : 1$

6. The kinetic energy of an electron is $10^{-20}\,J$, and photon also has the same energy. The wavelengths associated with these particles are λ_e *and* λ_{ph} respectively. These wavelengths are related as: $(m_e = 9.1\times10^{-31}kg, C = 3\times10^8 m/s)$

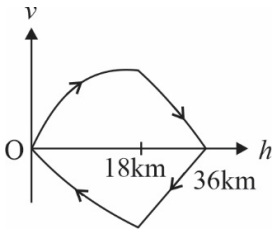
(A) $\lambda_{ph} = \lambda_e$ **(B)** $\lambda_{ph} < \lambda_e$ **(C)** $\lambda_e / \lambda_{ph} = c$ **(D)** $\lambda_{ph} > \lambda_e$

7. A rocket is fired vertically up from the ground and it ascends with a resultant acceleration of $10\,m/s^2$. The fuel of the rocket is finished 1 minute after firing. The velocity (v) versus height (h) graph for entire journey is: $(g = 10 m/s^2)$

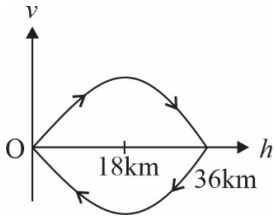
(A)



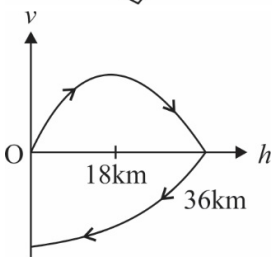
(B)



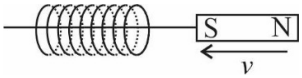
(C)



(D)



8. Predict the direction of induced current in the situation described in the following figure.



(A) The direction of the induced current as seen from magnet side of the coil is anti-clockwise

(B) The direction of the induced current as seen from magnet side of the coil is clockwise

(C) The direction of the induced current as seen from magnet side of the coil cannot be predicted

(D) The induced current as seen from magnet side of the coil is zero.

9. Starting from origin at $t = 0$, with initial velocity $5\hat{j}\ m/s$, a particle moves in the $x-y$ plane with a constant acceleration of $(10\hat{i} - 5\hat{j})\ m/s^2$. Find the coordinates of the particle at the moment its y-coordinate is maximum.

(A) $(5m, 5m)$ **(B)** $(2.5m, 2.5m)$ **(C)** $(5m, 2.5m)$ **(D)** $(2.5m, 5m)$

10. A circular current loop of magnetic moment M lies at rest in a plane perpendicular to an external uniform and constant magnetic field $\vec{B}$ such that $\vec{M} \parallel \vec{B}$. The work done to rotate the loop slowly by 30° about an axis passing through diameter is:

(A) $MB\left(1-\frac{\sqrt{3}}{2}\right)$ **(B)** $\sqrt{3}\frac{MB}{2}$ **(C)** $\frac{MB}{2}$ **(D)** zero

11. A ball of mass m moving with a speed u undergoes a head-on elastic collision with a ball of mass nm initially at rest. The fraction of initial energy transferred to the heavier ball is:

(A) $\frac{n}{1+n}$ **(B)** $\frac{n}{(1+n)^2}$ **(C)** $\frac{2n}{(1+n)^2}$ **(D)** $\frac{4n}{(1+n)^2}$

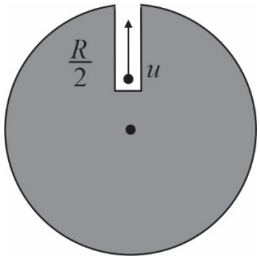
12. The cell of emf E is connected across a resistance r. The potential difference between the terminals of cell is found to be V. The internal resistance of cell must be:

(A) $\frac{2(E-V)}{r}$ **(B)** $\frac{2(E-V)r}{E}$ **(C)** $(E-V)r$ **(D)** $\frac{(E-V)}{V}r$

13. A beam of ultraviolet radiation having wavelength between 110.0 *nm* and 200.0nm is incident on a sample of atomic hydrogen. Assuming that the atoms are in ground state, the wavelength of lowest intensity in the transmitted beam is nearly: (*hc* = 1240 eV. nm)

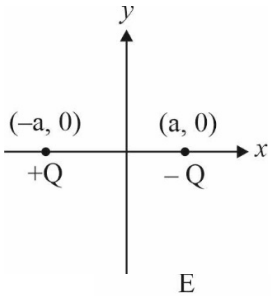
(A) 150 *nm* **(B)** 137.5 *nm* **(C)** 121.5 *nm* **(D)** 181.5 *nm*

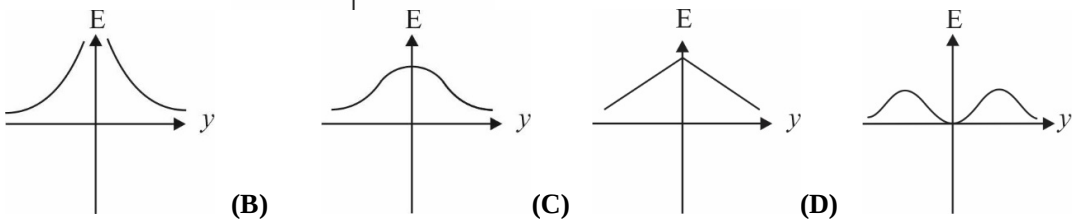
14. Assume that there is a smooth tunnel of depth $\frac{R}{2}$ along a diameter of earth. A particle is projected from the bottom of tunnel with speed *u*. Find the minimum value of *u* so that the particle is able to escape the gravitational field of earth. M and R represents mass and radius of earth.



(A) $\sqrt{\frac{2GM}{R}}$ **(B)** $2\sqrt{\frac{GM}{R}}$ **(C)** $\sqrt{\frac{11}{4}\frac{GM}{R}}$ **(D)** $\sqrt{\frac{11}{8}\frac{GM}{R}}$

15. For the given figure, the variation of magnitude of electric field on the y-axis as a function of 'y' is best represented by:



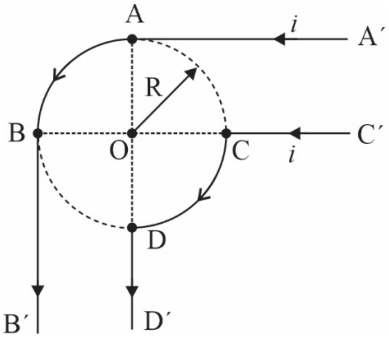


(A) **(B)** **(C)** **(D)**

16. If a simple pendulum having a string of with length L and a bob of mass *m* is vibrating with an amplitude 'A', then the maximum tension in the string is:

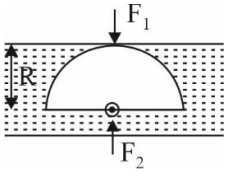
(A) $\frac{mg}{2}$ **(B)** $\frac{mg}{2}\left[1+2\left(\frac{A}{L}\right)^2\right]$ **(C)** $mg\left[1+\left(\frac{A}{L}\right)^2\right]$ **(D)** $\frac{mg}{2}\left[1+\left(\frac{A}{L}\right)^2\right]$

17. Two very long wires carrying equal current i are bent and arranged as shown in figure. Both AB and CD are arcs of the same circle, both subtending right angles at the centre O. The magnetic field at O is:



(A) $\frac{\mu_0 i}{4\pi R}$ **(B)** $\frac{\mu_0 i}{4\pi R}\sqrt{2}$ **(C)** $\frac{\mu_0 i}{2\pi R}$ **(D)** $\frac{\mu_0 i}{2\pi R}(\pi+1)$

18. A solid hemisphere is hinged below the liquid surface at a depth R as shown in figure. F_1 and F_2 are hydrostatics forces acting on the curved and flat surfaces of hemisphere respectively. P_0 is atmospheric pressure. R is radius of the hemisphere. The value of $\frac{F_1 - P_0\pi R^2}{F_2 - P_0\pi R^2}$ is:

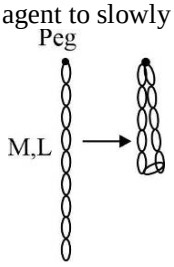


(A) $\frac{1}{2}$ **(B)** $\frac{1}{4}$ **(C)** $\frac{1}{3}$ **(D)** $\frac{2}{3}$

19. Dimensional formula for stefan's constant is: (here K denotes the temperature)

(A) $ML^2T^{-3}K^{-1}$ **(B)** $MT^{-3}K^{-4}$ **(C)** $MLT^{-2}K^{-4}$ **(D)** $MLT^{-2}K^{-2}$

20. What will be the work done by external agent to slowly hang the lower end of the chain to the peg?



(A) $-\frac{MgL}{2}$ **(B)** $\frac{MgL}{2}$ **(C)** $-\frac{MgL}{4}$ **(D)** $\frac{MgL}{4}$

SECTION-2

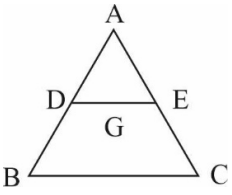
Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted.

The answer to each question is a NUMERICAL VALUE. For each question, enter the correct numerical value of the answer. If the answer is a decimal numerical value, then round-off the value to TWO decimal places. If the answer is an Integer value, then do not add zero in the decimal places. *In the OMR, do not bubble the ⊕ sign for positive values. However, for negative values, Θ sign should be bubbled.* (Example: 6, 81, 1.50, 3.25, 0.08)

21. A stationary vessel contains a mixture of equal moles of Nitrogen and Helium gas. The percentage of the total kinetic energy of the mixture that is possessed by the molecules of Nitrogen is _____.

22. A compound microscope consists of an objective lens of focal length 2.00 cm and an eyepiece of focal length 6.25 cm separated by a distance of 15.0 cm. How far (in cm) from the objective lens should an object be placed in order to obtain the final image at the least distance of distinct vision (25.0 cm)?

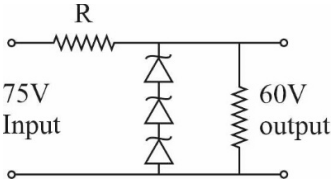
23. ABC is a plane lamina of the shape of an equilateral triangle. D, E are mid points of AB, AC and G is the centroid of the lamina. Moment of inertia of the lamina about an axis passing through G and perpendicular to the plane ABC is I_0. The moment of inertia of the part ADE about the same axis is $\frac{NI_0}{16}$ where N is an integer. Value of N is _____.



24. Photons of energy 7eV fall on the surface of a metal *X* resulting in emission of photoelectrons having maximum kinetic energy $E_1 = 1eV$. *Y* is another metal on the surface of which photons of energy 6eV are incident and result in emission of photoelectrons of maximum kinetic energy $E_2 = 2eV$. The ratio of work functions of metals *X* and *Y*, $\frac{\phi_x}{\phi_y}$ is_____.

25. Two men each of mass 75 kg, stand on the rim of a horizontal large disc diametrically opposite to each other. The disc has a mass 450 kg and is free to rotate about its axis. Each man simultaneously starts along the rim clockwise with the same speed and reaches their original starting points on the disc. The angle turned through by the disc with respect to the ground will be $2\pi/N$ in radians. Find the value of N.

26. Three; 10W, 20V, 1000 mA Zener diodes are connected as shown in figure. The value of R is _____ Ω.



27. An alternating voltage given by $V = 300\sqrt{2}$ sin (50*t*) (in volts) is connected across a 1μF capacitor through an *AC* ammeter. The reading of the ammeter will be _____ (in mA).

28. There are two radionuclei A and B. A is an alpha emitter and B is a beta emitter. The ratio of their disintegration constants $\lambda_A : \lambda_B$ is 1 : 2. The ratio of the number of atoms $N_A : N_B$ at time t = 0, so that probabilities of getting α and β particles are same at time $t = 0$, is _____.

29. An unpolarized light of intensity I_0 passes perpendicular through two polaroids; the axis of one is vertical and that of the other is at 30° to the vertical. The intensity of the transmitted light is $\frac{nI_0}{2^n}$. Find the value of *n*.

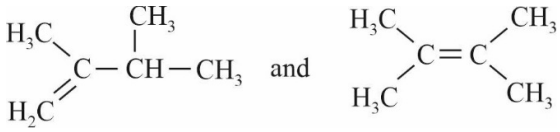
30. A person's eye has an angular resolution of $\phi = 5.08 \times 10^{-4}$ rad and a photoprinter prints a minimum of 300 dpi (dots per inch, 1 inch = 2.540 cm). The minimum distance at which a printed page be held so that the person does not see the individual dots is _____ cm.

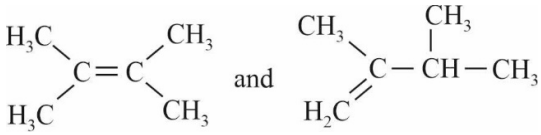
PART II : CHEMISTRY 100 MARKS

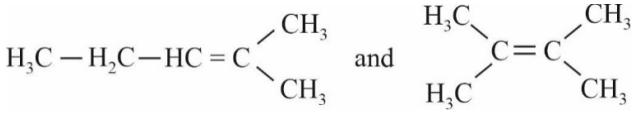
SECTION-1

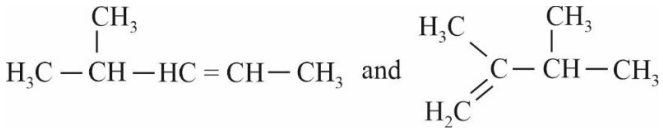
This section contains 20 Multiple Choice Questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE CHOICE is correct.

1. When 3,3-Dimethyl-2-butanol is heated with acid H_3PO_4, it is converted into an 80 : 20 mixture of alkene A and B respectively. The structure of A and B are:

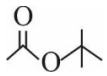
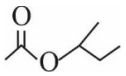
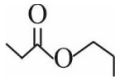
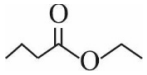
(A) 

(B) 

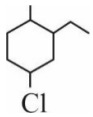
(C) 

(D) 

2. An organic Compound (A) with molecular formula $C_6H_{12}O_2$ was hydrolysed with dil. H_2SO_4 to give an alkene as major product and alcohol as minor product. The structure (A) is:

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

3. The IUPAC name of the following compound is:

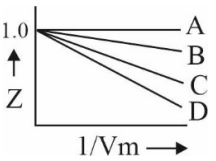


(A) 1-Chloro-5-ethyl-4-methylcyclohexane
(B) 1-Chloro-4-methyl-3-ethylcyclohexane
(C) 4-Chloro-2-ethyl-1-methylcyclohexane
(D) 1-Methyl-2-ethyl-4-chlorocyclohexane

4. On reacting copper with dilute nitric acid gives a colourless gas (A). The gas (A) on reacting with Fe^{2+} ion in concentrated sulphuric acid and water forms a brown coloured complex. The EAN of Iron in the brown coloured complex is: [Given: Atomic No.: Fe = 26]

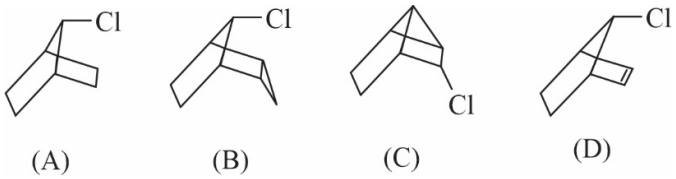
(A) 26 **(B)** 37 **(C)** 25 **(D)** 36

5. Consider the graph shown below which of the following gases have the highest critical temperature?



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

6. The decreasing order of reactivity of the following organic molecules towards $AgNO_3$ solution is:



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

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

7. Identify the correct statement from the options given below for the galvanic cell:

(A) Cathode in a voltaic cell loose weight during reaction

(B) ΔG is positive for spontaneous cell reaction in voltaic cell

(C) The voltaic cell is working in reverse direction if the e.m.f of a cell is negative

(D) The cell reaction is spontaneous in galvanic cell if E_{cell} is less than external potential applied in cell

8. The number of geometrical isomers possible for $\left[Pt(NO_2)(NH_3)(NH_2OH)(Py)\right]^+$

(A) 9 **(B)** 6 **(C)** 3 **(D)** 4

9. In the excess of air, the major oxides formed by Li, Na and K are Li_2O, Na_2O_2 and KO_2 respectively. Arrange all the given oxides in the decreasing order of their stability.

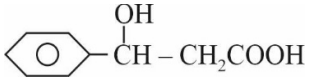
(A) $Li_2O > Na_2O_2 > KO_2$ **(B)** $KO_2 > Na_2O_2 > Li_2O$

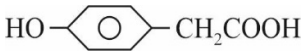
(C) $Na_2O_2 > KO_2 > Li_2O$ **(D)** $Li_2O > KO_2 > Na_2O_2$

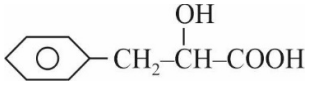
10. Which of the following amino acid at isoelectric point will react with nitrous acid and liberate nitrogen gas?

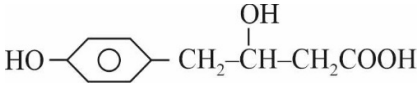
(A) Phenylalanine **(B)** Isoleucine **(C)** Lysine **(D)** Proline

11. [P] on treatment with H_2CrO_4 in acetone produced [Q]. [Q] compound upon heating give rise to Acetophenone. The compound [P] is:

(A) 

(B) 

(C) 

(D) 

12. Among statements (a) – (d), the correct ones are:

(a) Cryolite $Na_3[AlF_6]$ lowers the melting point of Al_2O_3 in Hall-Heroult process

(b) The method of zone refining of metals is based on the principle of solubility of the impurity in the molten state than in the solid state

(c) Extraction of Pb is possible by carbon reduction method

(d) In Hall-Heroult process, Aluminium is obtained at cathode and CO_2 at anode

(A) (a), (b), (c) and (d) **(B)** (a), (c) and (d) only

(C) (c) and (d) only **(D)** (b). (c) and (d) only

13. The elements Europium and Rutherfordium belong respectively to:

(A) Group 3 and Group 6 **(B)** Group 4 and Actinoids

(C) Lanthanoids and Group 4 **(D)** Group 4 and Group 10

14. Match the following

(i)	Paints	(P)	Solid sol
(ii)	Cloud	(Q)	Foam
(iii)	Hair cream	(R)	Sol
(iv)	Whipped cream	(S)	Emulsion
		(T)	Aerosol

(A) $(i) \to (P), (ii) \to (R), (iii) \to (S), (iv) \to (Q)$

(B) $(i) \to (S), (ii) \to (Q), (iii) \to (T), (iv) \to (P)$

(C) $(i) \to (R), (ii) \to (T), (iii) \to (S), (iv) \to (Q)$

(D) $(i) \to (T), (ii) \to (R), (iii) \to (Q), (iv) \to (S)$

15. Insoluble component of starch in water constituting 80% to 85% of starch is composed of –

(A) $\beta - D - \text{glucose}, C_1 - C_4$ and $C_2 - C_6$ linkages

(B) $\alpha - D - \text{glucose}, C_1 - C_4$ and $C_2 - C_6$ linkages

(C) $\beta - D - \text{glucose}, C_1 - C_4$ and $C_1 - C_6$ linkages

(D) $\alpha - D - \text{glucose}, C_1 - C_4$ and $C_1 - C_6$ linkages

16. Which of the following statement is incorrect?

(A) Work done is zero during expansion of 1 mole of an ideal gas into vacuum under isolated conditions

(B) For isothermal process, ΔU and ΔH are equal to zero

(C) Change in internal energy is zero during the mixing of equal volume of two ideal gases at constant temperature and pressure in an isolated container

(D) The change in internal energy of the gas is (i) zero, if it is expanded reversibly with $T_1 = T_2$ and (ii) positive, if it is expanded reversibly under adiabatic conditions with $T_1 \neq T_2$

17. The pair in which both the species have the same hybridization is

(A) $\left[Ni(NH_3)_6\right]^{2+}$ and $\left[Mn(CN)_6\right]^{4-}$ **(B)** $\left[Co(NH_3)_6\right]^{2+}$ and $\left[Mn(CN)_6\right]^{4-}$

(C) $\left[Cr(NH_3)_6\right]^{3+}$ and $\left[Co(H_2O)_6\right]^{2+}$ **(D)** $\left[Co(H_2O)_6\right]^{2+}$ and $\left[Ni(NH_3)_6\right]^{2+}$

18. Number of spectral line produced when electron jumps from gamma line region of Balmer series to ground state in hydrogen atom.

(A) 15 **(B)** 10 **(C)** 20 **(D)** 5

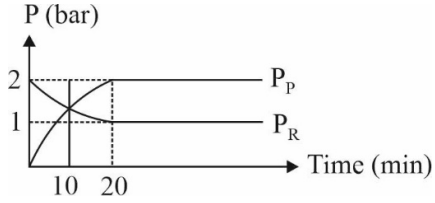
19. Arrange the following in the decreasing order of their thermal stability of Cl_2, F_2, I_2, Br_2.

(A) $F_2 > Cl_2 > Br_2 > I_2$ **(B)** $Cl_2 > Br_2 > F_2 > I_2$

(C) $Cl_2 > F_2 > Br_2 > I_2$ **(D)** $F_2 > Br_2 > Cl_2 > I_2$

20. For the reaction $R(g) \rightarrow 2P(g)$

Following observation is made at 300K.



Select the correct statements(s)

(A) $(\Delta_r G)$ at 10 min $= 0$ **(B)** $(\Delta_r G)$ at 20 min $= 0$

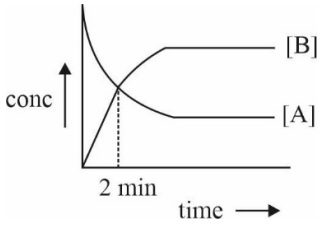
(C) $\Delta_r G^0$ at 10 min $= +ve$ **(D)** $\Delta_r G^0$ at 20 min $= 0$

SECTION-2

Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted.

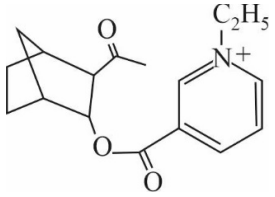
The answer to each question is a NUMERICAL VALUE. For each question, enter the correct numerical value of the answer. If the answer is a decimal numerical value, then round-off the value to TWO decimal places. If the answer is an Integer value, then do not add zero in the decimal places. *In the OMR, do not bubble the ⊕ sign for positive values. However, for negative values, Θ sign should be bubbled.* (Example: 6, 81, 1.50, 3.25, 0.08)

21. For the first order reaction, $A_{(g)} \rightarrow 3B_{(g)}$ the concentration versus time graph is given below



What is the half-life in minutes? (log 2 = 0.3, log 3 = 0.48)

22. The number of asymmetric centres present in the following compound are_____.



23. An ideal solution is formed by mixing of 460 g. of ethanol with xg. of methanol. The total vapour pressure of the solution is 72 mm of Hg. The vapour pressure of pure ethanol and pure methanol are 48 and 80 mm of Hg respectively. Find the value of x. [Given: Atomic mass H = 1, C = 12, O = 16]

24. A 0.0020 m aqueous solution of an ionic compound $Co(NH_3)_4(Cl)_3$ freezes at – 0.00732°C. Number of moles of AgCl precipitated when 1 mole of the above ionic compound is treated with $AgNO_3$ solution. $(K_f = 1.86^oC/m)$

25. A 20 ml solution containing 0.2 g impure H_2O_2 reacts completely with 0.316 g of $KMnO_4$ in acidic medium. What would be volume strength of H_2O_2 solution? [Given: Molar mass of H_2O_2 = 34 & $KMnO_4$ = 158 g/mol

26. The mass of dinitrogen in grams produced by the thermal decomposition of 2 moles of ammonium dichromate.

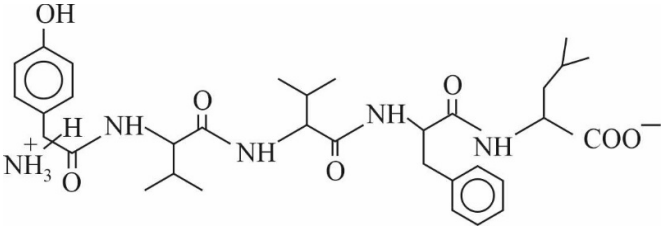
27. Amongst given polymers, how many of them are addition polymer.

(i)	Melmac	(ii)	ABS rubber	(iii)	Plexiglass
(iv)	Orlon	(v)	Teflon	(vi)	Kevlar
(vii)	Dextron	(viii)	Polyurethanes		

28. The maximum recommended levels in ppm of Zn metal in water sample which makes water suitable for drinking is_____.

29. The Reagent which is commercially known as 'calgon' that is used to remove the permanent hardness of water in Calgon's method. Find out the number of moles of calgon required to remove 12 moles of Ca^{2+} ion present in hard water.

30. The total number of distinct essential amino acids obtained after complete acidic hydrolysis of the peptide shown below is _____.



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 $\int \frac{2x^2\left(1+2x^2\right)}{\left(1+x^2+x^4\right)^2}dx$ is equal to

(A) $-\frac{x}{1+x^2+x^4}+\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{x-\frac{1}{x}}{\sqrt{3}}\right)-\frac{1}{4}\log\left(\frac{x+\frac{1}{x}-1}{x+\frac{1}{x}+1}\right)+C$

(B) $-\frac{x}{1+x^2+x^4}-\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{x-\frac{1}{x}}{\sqrt{3}}\right)+\frac{1}{2}\log\left(\frac{x+\frac{1}{x}-1}{x+\frac{1}{x}+1}\right)+C$

(C) $-\frac{x}{1+x^2+x^4}-\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{x-\frac{1}{x}}{\sqrt{3}}\right)+\frac{1}{4}\log\left(\frac{x+\frac{1}{x}+1}{x+\frac{1}{x}-1}\right)+C$

(D) $-\frac{x}{1+x^2+x^4}+\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{x-\frac{1}{x}}{\sqrt{3}}\right)+\frac{1}{4}\log\left(\frac{x+\frac{1}{x}-4}{x+\frac{1}{x}-4}\right)+C$

2. A vertical pole of length 15m standing on the point A. ABC are points on horizontal ground forming a triangle with $\angle A=90°$.

If $AB=6m$ and AC = $8m$ and a point 'D' (on horizontal plane) is equidistant from A, B, C. Find distance of D from top of the pole

(A) $5\sqrt{10}\,m$ **(B)** $10\sqrt{5}\,m$ **(C)** $6\sqrt{10}\,m$ **(D)** None of these

3. Find the sum of the series $\frac{^{100}C_{25}}{100}+\frac{^{99}C_{25}}{99}+\frac{^{98}C_{25}}{98}.....+\frac{^{50}C_{25}}{50}$

(A) $\frac{1}{25}\left[^{100}C_{25}+{}^{50}C_{25}\right]$ **(B)** $\frac{1}{25}\left[^{100}C_{25}-{}^{51}C_{25}\right]$

(C) $\frac{1}{25}\left[^{100}C_{25}-{}^{49}C_{25}\right]$ **(D)** $\frac{1}{25}\left[^{100}C_{25}-{}^{50}C_{26}\right]$

4. Given the following two statements

$S_1:(p\wedge\sim p)\to(p\wedge q)$ is a tautology.

$S_2:(p\vee\sim p)\to(p\vee q)$ is a fallacy

(A) S_1 is true **(B)** S_2 is true

(C) Both S_1 *and* S_2 *are true* **(D)** None of these

5. If $f(x)=\sqrt{\cos^2 x}+\sqrt{\sin^2 x}$ *then* $\int_{-3/2}^{3/2}\left[f(x)\right]dx=$

Where [ ] G.I.F.

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

6. $f(x)=\sin^{-1}(\sin x)$ then $\frac{d}{dx}f(x)$ at $x=\frac{7\pi}{2}$ is

(A) 1 **(B)** –1

(C) Not differentiable **(D)** None of these

7. Let $f(x)=\begin{vmatrix}\bar{a}.\bar{a} & \bar{a}.\bar{b} & \bar{a}.\bar{c}\\ \bar{b}.\bar{a} & \bar{b}.\bar{b} & \bar{b}.\bar{c}\\ \bar{c}.\bar{a} & \bar{c}.\bar{b} & \bar{c}.\bar{c}\end{vmatrix}$ where

$\bar{a}=\hat{i}+x\hat{j}+x^2\hat{k}$

$\bar{b}=x\hat{i}+x^2\hat{j}+\hat{k}$

$\bar{c}=x^2\hat{i}+\hat{j}+x\hat{k}$

Then stationary points of $f(x)$ are-

(A) $x=0,1$ **(B)** $x=-1,0$ **(C)** $x=-1$ only **(D)** None of these

8. If an ellipse and a hyperbola having centre at origin and foci on (± 10, 0), if the distance between their Directix (both in positive direction of x axis) is 10 units, find Difference of Squares of the Lengths of their major Axis and Transverse axis

(A) 400 **(B)** 300 **(C)** 200 **(D)** 160

9. $f(x)=\int_0^x\frac{x^2+x+1}{x+1+\sqrt{x}}dx$, then $f(1)=$

(A) $\frac{7}{6}$ **(B)** $\frac{2}{3}$ **(C)** $\frac{11}{6}$ **(D)** $\frac{5}{6}$

10. If roots of $px^2-3x+2=0$ are α,β and that of $qx^2-7x+2=0$ are γ,δ are such that $\alpha,\beta,\gamma,\delta$ are in HP then p + q =

(A) 5 **(B)** 7 **(C)** 11 **(D)** 13

11. Equation of normal to hyperbola $x^2-y^2=2$

Passing through (6, 0)

(A) $\frac{x}{3}\pm\frac{y}{\sqrt{7}}=2$ **(B)** $\frac{x}{3}\pm\frac{y}{\sqrt{5}}=2$ **(C)** $\frac{x}{3}\pm\frac{y}{7}=2$ **(D)** $\frac{x}{3}\pm\frac{y}{5}=2$

12. Three natural numbers in AP are removed from first 21 natural numbers. Mean of remaining numbers is 11. The sum of all common difference of all such possible increasing AP is.

(A) 36 **(B)** 45 **(C)** 55 **(D)** 67

13. If $z_1=3+4i$ *and* $z_2=2+i$, *and* z satisfy the equation $2\left(z+\bar{z}\right)+3\left(z-\bar{z}\right)i=0$, Then for Minimum value of $|z-z_1|+|z-z_2|$, possible value of z can be

(A) $\frac{15}{7}+\frac{10}{7}i$ **(B)** $\frac{15}{7}+\frac{8}{7}i$ **(C)** $\frac{15}{7}+\frac{9}{7}i$ **(D)** $\frac{10}{7}+\frac{15}{7}i$

14. If $\left(x+\sqrt{1+x^2}\right)\left(y+\sqrt{1+y^2}\right)=1$ then $\frac{dy}{dx}$ may be equals to

(A) 0 **(B)** -1 **(C)** 1 **(D)** None of these

15. If $A=\begin{bmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix}$ where $\theta=\frac{2\pi}{7}$ then $\sum_{r=1}^{6}A^r=$

(A) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ **(B)** $\begin{bmatrix}3 & 0\\ 0 & 3\end{bmatrix}$ **(C)** $\begin{bmatrix}-1 & 0\\ 0 & -1\end{bmatrix}$ **(D)** None of these

16. A survey shows that in a city 60% families own a car, 80% families have a scooter, and 40% have a bicycle. Also 30% own both a Car and scooter, 35% Car and bicycle and 25% scooter and bicycle, and some families owns all the three. Now the families who have neither of the three can be

(A) 7 % **(B)** 11% **(C)** 12% **(D)** 15%

17. $\left(1^2-2^2+3^2\right)+\left(4^2-5^2+6^2\right)+\left(7^2-8^2+9^2\right)....30\,\text{terms}$

(A) 82395 **(B)** 80396 **(C)** 82389 **(D)** 82399

18. $xdy-ydx=2x^3y\left(xdy+ydx\right)$ if $y(1)=1$, then $y(2)+y\left(\frac{1}{2}\right)=$

(A) $\frac{65}{8}$ **(B)** $\frac{8}{65}$ **(C)** $\frac{65}{\sqrt{8}}$ **(D)** 65

19. In an equilateral triangle having vertex $A(8,9)$, $B(-4,3)$, $C(h,k)$ sum of all possible h and k

(A) 13 **(B)** 16 **(C)** 26 **(D)** 43

20. $\sum_{r=1}^{10}\left(r+\left\{\frac{r}{7}\right\}+\left\{\frac{2r}{7}\right\}\right)=$ where $\{x\}\to$ fractional part function

(A) $\frac{445}{7}$ **(B)** $\frac{454}{7}$ **(C)** $\frac{447}{17}$ **(D)** $\frac{447}{7}$

SECTION-2

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21. If $f(x)+f(y)=f\left(xy-\sqrt{1-x^2}\sqrt{1-y^2}\right)$, $f(0)=\frac{\pi}{2}$ and f is differentiable in (–1, 1).

Then $\left|\lim_{x\to 0}\frac{2f(x)-\pi}{x}\right|=$

22. Plane $x+y+z=1$ cuts the *x, y, z* Axis at A,B,C respectively the distance of plane from point *P* such that $OP=PA=PB=PC$ is *D*, then $4\sqrt{3}\,D=$ (where O is origin)

23. $4x+3y+2z=1$
$x-y+3z=4$
$2x+5y-4z=6$ has *n* solution than *n* =

2**4.** 15 identical balls are placed in 3 different boxes, find the probability that each box contain at least 3 balls is *p* than 34*p* =

25. $\left(1+2x+3x^2\right)^{15}=\sum_{r=0}^{30}a_r x^r$ then digit at the unit place of $a_0+a_1+a_{30}$ *is*

26. $\int\sqrt{\cos x\left(\cos^3 x+\sin 2x\right)}dx=\frac{1-\sin x}{k}\sqrt{1+2\sin x-\sin^2 x}+\sin^{-1}\left(\frac{1-\sin x}{\sqrt{2}}\right)+c$ then 3k =

27. In a series of 7, T-20 matches between India and England, winning probability is $\frac{2}{5}$ *and* $\frac{3}{5}$ respectively for India and England. If probability of India winning n matches is highest then *n* is

28. If $[a,b]$ is Range of function $f(x)=\sin^{-1}x+\cos^{-1}x+\tan^{-1}x$ then no. of roots of the equation $1-|x|=\tan^{-1}x$ is $[b]+k$ then $k=$

29. If $A(0,0)$ and $C(6,-8)$ are end points of diagonal of a square then sum of square of abscissa of other vertex is

30. No. of digits while counting from 1 to 10,000 is N, then digits at unit place of N is

End of Mock JEE Main-3