VMC Vidyamandir Classes SINCE 1986
IIT JEE | MEDICAL | FOUNDATION

CODE A

Mock JEE Main - 7 | JEE

[redacted] Maximum Marks: 300

Timing: 04:00 PM to 04:00 AM

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, 0 for all other cases. There is no negative marking.

Name of the Candidate (In CAPITALS) : _____

Roll Number : _____

OMR Bar Code Number : _____

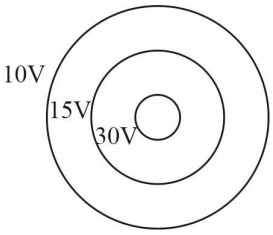
Candidate's Signature : _____ **Invigilator's Signature** _____

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. The diagram shows three concentric conducting spherical shells having radii R, 2R and 3R. All three shells are given some charges. The initial potential of each shell is as mentioned in the figure. If the inner most shell is earthed then the final charge present on its outer surface would be equal to:



(A) Zero **(B)** $40\pi\varepsilon_0 R$ **(C)** $4\pi\varepsilon_0 R$ **(D)** $-\pi\varepsilon_0 R$

2. An electromagnetic wave travels in vacuum with electric field as:
$\vec{E} = E_1\hat{i}\cos(kz-\omega t) + E_2\hat{j}\cos(kz+\omega t)$.
The associated magnetic field is given as:

(A) $\vec{B} = \frac{1}{c}\left(E_1\hat{i} - E_2\hat{j}\right)\cos(kz-\omega t)$

(B) $\vec{B} = \frac{1}{c}\left(E_1\hat{i} + E_2\hat{j}\right)\cos(kz+\omega t)$

(C) $\vec{B} = \frac{E_1}{c}\hat{j}\cos(kz-\omega t) + \frac{E_2}{c}\hat{i}\cos(kz+\omega t)$

(D) $\vec{B} = \frac{E_1}{c}\hat{i}\cos(kz-\omega t) + \frac{E_2}{c}\hat{j}\cos(kz+\omega t)$

3. A block 'A' of mass m attached to a massless spring is performing oscillatory motion of amplitude 'A' on a frictionless horizontal plane. If it collides elastically with another block 'B' of mass 2m kept initially at rest, when 'A' is passing through its equilibrium point, the amplitude of oscillation for the block 'A' become fA. The value of f is:

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

4. A wave propagates on a string in the positive x-axis with a velocity v. The shape of string at $t = t_0$ is given as $y(x,t_0) = A\sin\left(\frac{x}{b}\right)$. The wave equation for a general time t is:

(A) $y(x,t) = A\sin\left[\frac{x - v(t-t_0)}{b}\right]$ **(B)** $y(x,t) = A\sin\left[\frac{x-vt}{b}\right]$

(C) $y(x,t) = A\sin\left[\frac{(x+vt)}{b}\right]$ **(D)** $y(x,t) = A\sin\left[\frac{x+v(t-t_0)}{b}\right]$

5. A copper ring of radius R = 8 cm and circular cross-sectional $A = 2mm^2$ is in a homogeneous magnetic field whose induction is perpendicular to its plane and changes uniformly. At t = 0 the induction is $B_0 = 0$ and in $t = 0.2s$ it increases to B = 2T. The angular velocity ω at which the ring should be rotated uniformly in order not to have tensile stress in it at time instant $t_1 = 0.1s$ is approximately: (mass of the ring m = 9 gram, Resistance = $5m\Omega$, self-induction and gravity can be neglected)

(A) $1.2\times10^3\, rad/\sec$ **(B)** $2.4\times10^3\, rad/\sec$

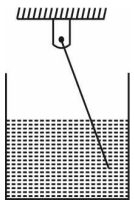
(C) $4.8\times10^2\, rad/\sec$ **(D)** $1.7\times10^2\, rad/\sec$

6. The mass density of a planet of radius R varies with the distance r from its centre as $\rho(r) = \rho_0\left(1-\frac{r^3}{R^3}\right)$.

Then the gravitational field is maximum at:

(A) $r = \frac{1}{\sqrt{2}}R$ **(B)** $r = \sqrt{\frac{3}{4}}R$ **(C)** $r = \frac{R}{4^{1/3}}$ **(D)** $r = \frac{R}{2^{1/3}}$

7. A uniform rod of length b capable of turning about its end which is out of water, rests inclined to the vertical. If the specific gravity of the rod is $\frac{5}{9}$, find the length of the rod immersed in water.



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

8. The binding energy (in MeV) of a nitrogen nucleus $\left({}^{14}_{7}N\right)$ is :

(Given mass of nucleus $m\left({}^{14}_{7}N\right) = 14.00307u$, mass of proton $m_p = 1.00783u$,

mass of neutron $m_n = 1.00867u$ and $1u = 931.5MeV/c^2$)

(A) 204.2MeV **(B)** 104.7MeV **(C)** 124.2Mev **(D)** 110.7Mev

9. Suppose a pure Si crystal has 5×10^{28} atoms/m^3. It is doped by 1 ppm concentration of pentavalent As. The number of holes $\left(n_i = 1.5\times10^{16}/m^3\right)$ is:

(A) $4.5\times10^9/m^3$ **(B)** $7\times10^9/m^3$ **(C)** $1.5\times10^{12}/m^3$ **(D)** $4\times10^8/m^3$

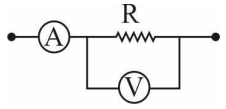
10. Light of wavelength λ in air enters a medium of refractive index μ. Two points in this medium, lying along the path of this light are at a distance x apart. The phase difference between these points is:

(A) $\frac{2\pi}{\lambda}\mu x$ **(B)** $\frac{2\pi x}{\mu\lambda}$ **(C)** $(\lambda-1)\frac{2\pi}{\lambda}x$ **(D)** $\frac{2\pi x}{\lambda(\mu-1)}$

11. In the circuit shown the readings of ammeter and voltmeter are 4A and 20V respectively. The meters are non-ideal, then R is:

(A) 5Ω **(B)** less than 4Ω

(C) greater than 5Ω **(D)** between 4Ω and 5Ω

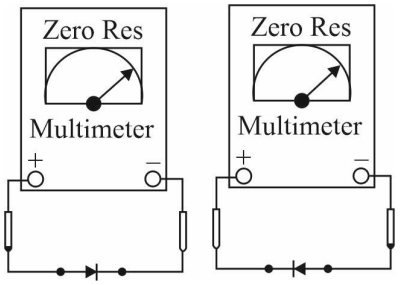


12. Three samples of the same gas A, B and C $(\gamma = 3/2)$ have initially equal volume. Now the volume of each sample is doubled. The process is adiabatic for A, isobaric for B and isothermal for C. If the final pressures are equal for all three samples, the ratio of their initial pressures are:

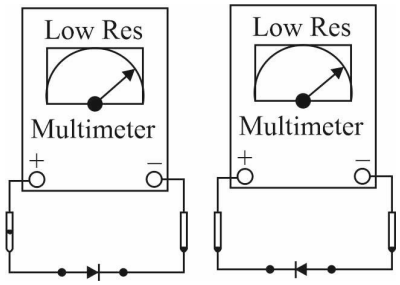
(A) $2\sqrt{2}:2:1$ **(B)** $2\sqrt{2}:1:2$ **(C)** $\sqrt{2}:1:2$ **(D)** $2:1:\sqrt{2}$

13. In testing a diode by a multimeter which option shows correct readings for a non-defective diode? Multimeter resistance measurement position is set in the range $10k\Omega$.

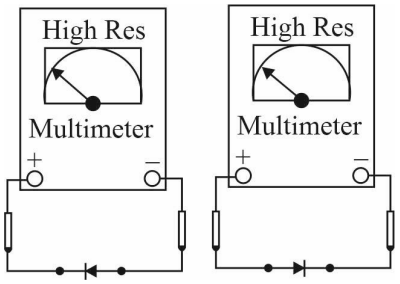
(A)



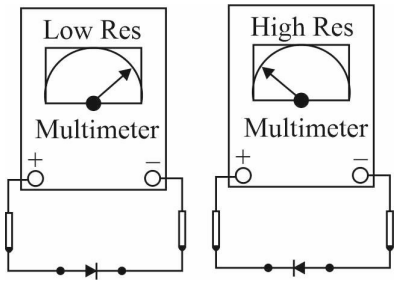
(B)



(C)



(D)



14. Steam at 100°C is passed into a calorimeter of water equivalent 10gm containing 74gm of water and 10gm of ice at 0°C. If the temperature of the calorimeter and its contents rises to 5°C, the amount of steam passed (Latent heat of vapourisation = 540 cal/g, latent heat of fusion = 80 cal/g) is:

(A) 3 gm **(B)** 4 gm **(C)** 2 gm **(D)** 5 gm

15. A smooth spherical ball strikes a smooth horizontal floor at an angle $\theta = 45°$. The coefficient of restitution between the ball and the floor is $e = \frac{1}{2}$. The fraction of its kinetic energy lost in collision is: (there is no rotational kinetic energy before or after collision)

(A) $\frac{5}{8}$ **(B)** $\frac{3}{8}$ **(C)** $\frac{3}{4}$ **(D)** $\frac{1}{4}$

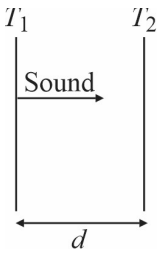
16. Amount of radiation energy emitted by unit surface area per unit time by a body is defined as its emissive power. Dimension of Emissive power is:

(A) $\left[M^2L^0T^{-1}\right]$ **(B)** $\left[MLT^{-2}\right]$ **(C)** $\left[ML^2T^{-2}\right]$ **(D)** $\left[ML^0T^{-3}\right]$

17. The absolute temperature of air in a region linearly increases from T_1 *to* T_2 in a space of width *d*. The time taken by the sound wave to travel in this region is (The velocity of sound at 273 K is *v*):

(A) $\frac{2d}{v}\frac{\sqrt{273}}{\sqrt{T_1+T_2}}$ **(B)** $\frac{2d}{v}\frac{\sqrt{T_1}+\sqrt{T_2}}{\sqrt{273}}$

(C) $\frac{2d}{v}\frac{\sqrt{273}}{\sqrt{T_1}+\sqrt{T_2}}$ **(D)** $\frac{2d}{v}\frac{T_1+T_2}{273}$



18. A proton and an $\alpha-$particle both initially at rest are accelerated in a region of electric potential difference V and gravity free space. The proton is projected with gained kinetic energy against a uniform constant electric field and comes to momentary rest after travelling a distance S_0. If the $\alpha-$particle is also projected with gained kinetic energy against same electric field, it will come to momentary rest after travelling through:

(A) S_0 **(B)** $\sqrt{5}S_0$ **(C)** $\frac{S_0}{2}$ **(D)** $\frac{S_0}{2\sqrt{2}}$

19. A source of light emits monochromatic visible light of wavelength 500 nm. The source emits light of power 100W. The number of photons emitted per sec of the visible light of the given wavelength is: $\left(hc=1240eV.nm\right)$

(A) 2.5×10^{19} **(B)** 5.0×10^{19} **(C)** 4.5×10^{20} **(D)** 2.5×10^{20}

20. The torque $\vec{\tau}$ acts on a body about a given point is found to be equal to $\vec{A}\times\vec{L}$ where $\vec{A}$ is a constant non-zero vector and $\vec{L}$ is the angular momentum of the body about that point. Choose the incorrect option: $\left(\hat{A}\neq\pm\hat{L}\right)$

(A) $\frac{\overrightarrow{dL}}{dt}$ is perpendicular to $\vec{L}$ at all instants of time

(B) The component of $\vec{L}$ in the direction of $\vec{A}$ does not change with time

(C) The magnitude of $\vec{L}$ does not change with time

(D) $\vec{L}$ does not change with time

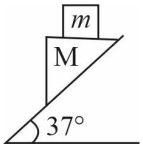
SECTION-2

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**..

21. A double convex lens is made of glass which has its refractive index of 1.55 for violet rays and 1.50 for red rays. If the focal length for violet rays is 20 cm, then the focal length for red rays will be _____ cm.

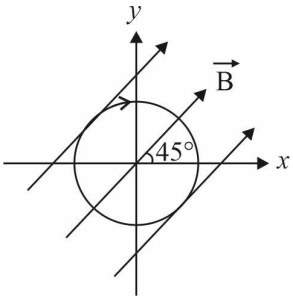
22. A 100 eV electron collides with a stationary helium ion He^+ in its ground state and excites it into higher energy level *n*. After collision He^+ ions emits two photons in succession with a wavelength 1085Å and 304Å to reach its ground state. Quantum number of excited state *n* is _____.

23. Block of mass M slides down on frictionless incline as shown. The minimum friction coefficient so that block of mass *m* does not slide with respect to lower block is close to $\frac{I}{1000}$, the nearest integer to I is _____. $\left(\sin 37° \approx \frac{3}{5}\right)$ {Take $g = 10\ m/s^2$ }

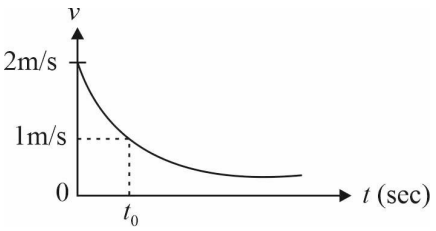


24. Three points masses *m*, 2*m* and 3*m* are located at the vertices of an equilateral triangle of side '*a*'. The moment of inertia of the system about an axis along the altitude of the triangle passing through *m* is $\frac{N}{20}ma^2$ where N is an integer. The value of N is _____.

25. A circular loop of radius R = 20 cm is placed in a uniform magnetic field $B = 7T$ in x-y plane as shown in figure. The loop carries a current $i = 1.0$ A in the direction shown in figure. The magnitude of torque acting on the loop is ____ N.*m*. {Take $\pi = \frac{22}{7}$}



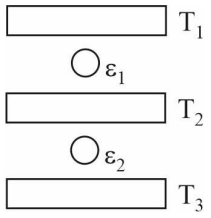
26. A 1kg particle is moving unidirectionally on a horizontal plane under the action of power $P = -2v^3$, of power supplying energy source. The velocity (v) – time (t) graph that describes the motion of the particle is shown in figure. (Graphs are drawn schematically and are not to scale) The value of t_0 in graph is x sec. Find $8x$



27. A hot body is being cooled in air according to Newton's law of cooling, the rate of fall of temperature being k times the difference of its temperature with respect to that of surroundings. The time after which the rate of heat loss of the body will be half of the maximum rate of heat loss is $\frac{1}{2k}\log_e n$ (The time is to be counted from the instant $t = 0$). The value of n is _____.

28. A paramagnetic sample shows a net magnetisation of 12 A/m when placed in an external magnetic field of 0.6T at a temperature of 4K. When the same sample is placed in an external magnetic field of 0.2T at temperature of 16K, the net magnetisation will be _____ A/m.

29. Two carnot engines operate in series between a heat source at a temperature $T_1 = 900K$ and heat sink at temperature $T_3 = 400K$. There is another reservoir at temperature T_2, as shown, with $T_1 > T_2 > T_3$. The two engines are equally efficient if T_2 = _____ K.



30. A point object moves towards a concave mirror with a speed $10cm\,s^{-1}$ along the principal axis. The magnitude of the velocity of object with respect to image when the object is at distance of 15 cm from the pole is ____ $cm\,s^{-1}$. (Focal length of the mirror kept at rest is 10 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. Among the following statements, identify the correct set of statements:

(A) Size of Li is smaller than Mg

(B) Both Li and Mg form covalent compounds readily

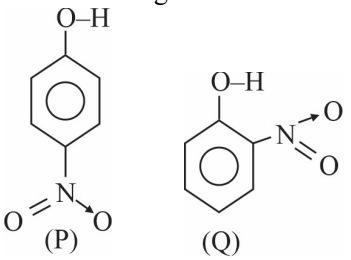
(C) Both Li and Mg react with nitrogen and form nitride

(D) Oxides of Li and Mg do not combine with excess oxygen to give superoxides

(A) (A), (B), (C) and (D) **(B)** (B), (C) and (D)

(C) (A), (B) and (C) **(D)** (C) and (D)

2. Consider the following molecules and statements related to them:



(a) (Q) is more volatile than (P)

(b) (Q) has higher boiling point than (P)

(c) (P) dissolves more readily than (Q) in water

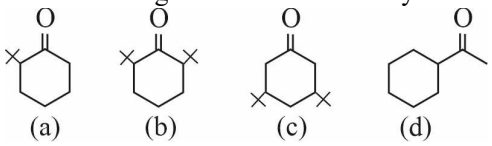
(d) pk_a value of (P) is higher than (Q)

Identify the correct option from below:

(A) (a) and (b) are true **(B)** (a) and (c) are true

(C) only (a) is true **(D)** (b) and (c) are true

3. The increasing order of the reactivity of the following compounds in nucleophilic addition reaction is:

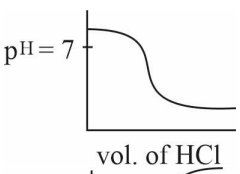


(A) (a) < (b) < (c) < (d) **(B)** (d) < (c) < (b) < (a)

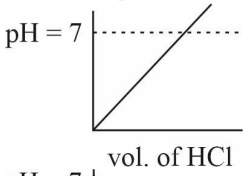
(C) (b) < (a) < (d) < (c) **(D)** (b) < (a) < (c) < (d)

4. 100 ml of 0.1 M NH_4OH is taken in a beaker and 100 mL of 0.1 M HCl is added into it and the pH is continuously measured. Which of the following graphs correctly depicts the change in pH?

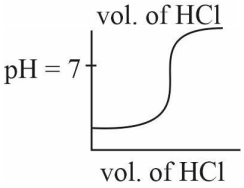
(A)



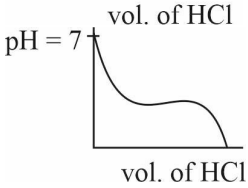
(B)



(C)



(D)



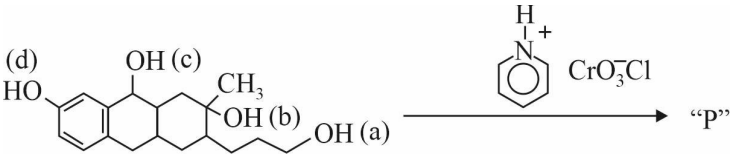
5. A container contains O_2, He and SO_2 gases such that mass of SO_2 is double the mass of O_2 and mass of He is half the mass of O_2 gas. The sum of mole fraction of all the gases is:

(A) 1 **(B)** 3 **(C)** 5 **(D)** 8

6. Maximum number of different photons emitted when only two H atoms are placed in a container and each is present in 3rd excited state:

(A) 6 **(B)** 3 **(C)** 1 **(D)** 4

7. Consider the following reaction:



The product 'P' gives positive acetyl chloride test. This is because of the presence of which of these –OH group(s)?

(A) (b) only **(B)** (c) and (d) **(C)** (d) only **(D)** (b) and (d)

8. CMC is the particular concentration above which micelle formation takes place. CMC for soap lies between:

(A) 10^5 to 10^6 mol l^{-1} **(B)** 10^{-4} to 10^{-3} mol l^{-1}

(C) 10^4 to 10^3 mol l^{-1} **(D)** 10^{-5} to 10^{-6} mol l^{-1}

9. The incorrect statement is:

(A) chromate and dichromate ions are diamagnetic

(B) Dichromate ion is a weaker base than chromate ion

(C) Chromate ion is yellow in colour and dichromate ion is orange in colour

(D) Chromate ion has a tetrahedral shape whereas dichromate ion has two tetrahedral units with two common oxygen bond

10. Which of the following statement is incorrect statement for photochemical smog?

(A) Photochemical smog leads to cracking of Rubber

(B) It causes corrosion of metals

(C) It is known as reducing smog

(D) It forms in warm, dry and sunny climate

11. The compound 'A' in the following Reaction is:

$$A \xrightarrow[(2)\ Zn/H_2O]{(1)\ O_3} B + C$$

$$B \xrightarrow{\text{dil. KOH}} CH_3-\underset{\underset{OH}{|}}{CH}-CH_2-\overset{\overset{O}{||}}{C}-H \xrightarrow{HCN} D$$

$$C \xrightarrow{\text{conc KOH}} \text{Benzyl alcohol + salt of Benzoic Acid}$$

$$D \xrightarrow[\Delta]{H_3O^+} E$$

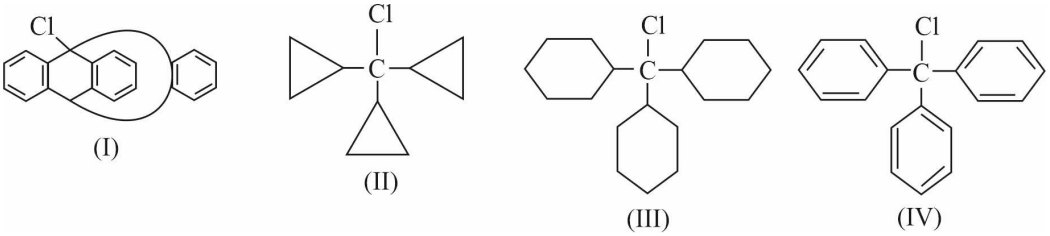
(A) $Ph-CH=CH-CH_3$ **(B)** $CH_3-\underset{\underset{CH_3}{|}}{C}=CH-CH_3$

(C) $Ph-\underset{\underset{CH_3}{|}}{C}=CH-CH_3$ **(D)** $Ph-CH_2-\underset{\underset{CH_3}{|}}{C}=CH_2$

12. Volume strength of original peroxide solution is 16.8V. Determine the molarity and normality of peroxide solution respectively:

(A) 3 and 3 **(B)** 3 and 1.5 **(C)** 1.5 and 3 **(D)** 1.5 and 1.5

13. Arrange the following in increasing order of reactivity towards $AgNO_3$ solution:



(A) (II) < (III) < (I) < (IV) **(B)** (I) < (III) < (IV) < (II)

(C) (III) < (II) < (IV) < (I) **(D)** (IV) < (II) < (III) < (I)

14. For the reaction $A+2B\rightarrow 3C+D$, which of the following expression represents the rate of formation of C, in terms of rate of decomposition of A:

(A) $\frac{d[C]}{dt}=3\frac{d[A]}{dt}$ **(B)** $\frac{d[C]}{dt}=\frac{d[A]}{dt}$ **(C)** $\frac{d[C]}{dt}=\frac{1}{3}\frac{d[A]}{dt}$ **(D)** $\frac{3d[C]}{dt}=\frac{d[A]}{dt}$

15. The five successive ionization enthalpies of an element are 710, 1414, 2550, 28124 and 33845 kJ mol^{-1}. How many moles of H_2SO_4 will be needed to react completely with 4 moles of the metal hydroxide?

(A) 3 **(B)** 6 **(C)** 1 **(D)** 2

16. Complex A has a composition of $H_{12}O_6Cl_3Cr$. It has green colour. A 0.2M solution of complex when treated with excess of $AgNO_3$ gave 57.45gm of white precipitate. The formula of the complex would be: [Given: at mass Cr = 52 amu, Cl = 35.5 amu, Ag = 107.8 amu]

(A) $\left[Cr(H_2O)_6\right]Cl_3$ **(B)** $\left[CrCl(H_2O)_5\right]Cl_2.H_2O$

(C) $\left[CrCl_2(H_2O)_4\right]Cl.2H_2O$ **(D)** $\left[Cr(H_2O)_3Cl_3\right]$

17. The d-electron configuration of $\left[Fe(H_2O)_5(NO)\right]^{2+}$ and $K_3\left[Cr(CN)_6\right]$ respectively are:

(A) $t_{2g}^5e_g^2$ and $t_{2g}^3e_g^0$ **(B)** $t_{2g}^4e_g^2$ and $t_{2g}^6e_g^0$

(C) $t_{2g}^6e_g^0$ and $t_{2g}^4e_g^2$ **(D)** $t_{2g}^4e_g^2$ and $t_{2g}^4e_g^2$

18. Three isomers A, B and C (mol. formula $C_{10}H_{12}O_2$) gives the following results:

$B \text{ or } C \xrightarrow{\text{Decarboxylation}} D(C_9H_{12})$

$A \xrightarrow{\text{Decarboxylation}} E(\text{an isomer of D})$

Both D and E are non-resolvable.

$D \text{ or } E \xrightarrow{H^+/KMnO_4} \text{Benzoic acid}$

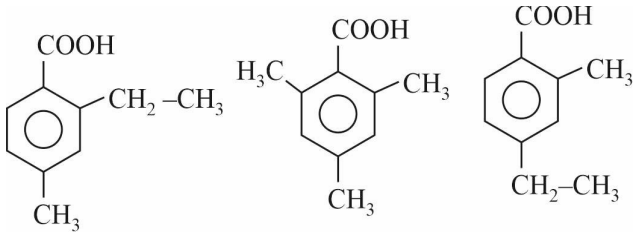
B is more reactive than C towards decarboxylation reaction.

A, B, C respectively are:

(A) $Ph-CH_2-\underset{}{\overset{CH_3}{\underset{|}{CH}}}-COOH$ $\quad Ph-\underset{}{\overset{COOH}{\underset{|}{CH}}}-CH_2CH_3$ $\quad Ph-\underset{}{\overset{CH_3}{\underset{|}{CH}}}-CH_2COOH$

(B) $Ph-\underset{}{\overset{CH_3}{\underset{|}{CH}}}-CH_2COOH$ $\quad Ph-\underset{}{\overset{COOH}{\underset{|}{CH}}}-CH_2CH_3$ $\quad Ph-CH_2-\underset{}{\overset{CH_3}{\underset{|}{CH}}}-COOH$

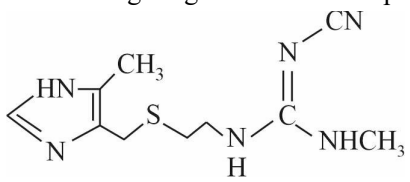
(C)



(D) $Ph-CH_2-\underset{CH_3}{\underset{|}{CH}}-COOH$ $\quad CH_3-\underset{CH_3}{\overset{Ph}{\underset{|}{\overset{|}{C}}}}-COOH$ $\quad Ph-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{CH}}}}-CH_2-COOH$

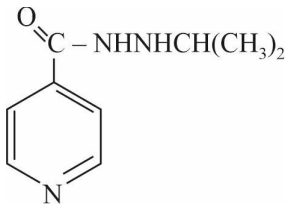
19. Match the following drugs with their therapeutic action:

(I)



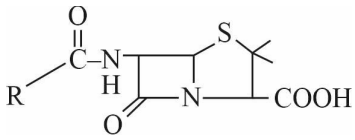
(a) Antidepressant

(II)



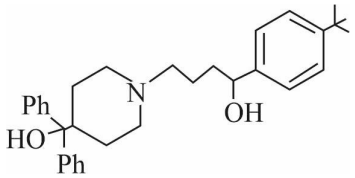
(b) Antibiotic

(III)



(c) Antihistamine

(IV)

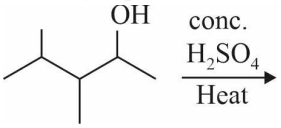


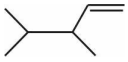
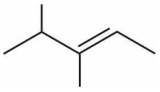
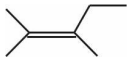
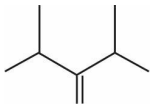
(d) Antacid

(e) Analgesic

(A) (I)-(a); (II)-(c) ; (III)-(b); (IV)-(e)
(B) (I)-(d); (II)-(a) ; (III)-(b); (IV)-(c)
(C) (I)-(e); (II)-(a) ; (III)-(c); (IV)-(d)
(D) (I)-(d); (II)-(c) ; (III)-(a); (IV)-(e)

20. The major product of the following reaction is:



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

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**.

21. 1.34% solution of KNO_3 is isotonic with 4.77% solution of glucose. Find the percent of dissociation of KNO_3. (Given : Atomic mass K = 39.1 amu, N = 14 amu and O = 16 amu)

22. A weakly alkaline solution of permanganate is electrolysed for 50 minutes using 2A current. The amount of oxide of manganese obtained. (Given : Atomic mass Mn = 55 amu and O = 16 amu)

23. The number of ketonic $>C=O$ groups present in a tripeptide gly – ser–val are_____.

24. The density of a solution prepared by dissolving 1 gram molecule of sucrose in 1000 gram of water is 1.15 gm/ml. The molarity of the solution is_____.

25. The volume (in mL) of 0.01M NaOH required to neutralise 20ml of 0.01M ortho-phosphoric acid is____.

26. How many peroxide linkages are present in a compound of chromium with oxygen which is blue in colour and soluble in amyl alcohol, produced by treating K_2CrO_4 with acidified H_2O_2 ?

27. How many of these compounds will undergo disproportionation on hydrolysis?
$CO_2, NO_2, Cl_2, F_2, ClO_2, Cl_2O_6, N_2O_5, SO_3, P_4O_{10}$

28. Number of degree of unsaturation present in cimetidine_____.

29. Identify the numbers of amphiprotic species in the following list?
$H_3O^+, HPO_4^{2-}, HCO_3^-, H_2O, HPO_3^{2-}, H_2PO_2^-, H_2PO_4^-, H_2PO_3^-, PO_4^{3-}, NH_4^+$

30. Number of geometrical isomers of a complex ion $\left[Pt(PPh_3)_2(Py)_2Cl_2\right]^{2+}$ are x, if 1 mole of ethylenediamine replaces two weakest ligands then new complex formed has 'y' number of geometrical isomers. Find the values of $\frac{x}{y}$.

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. Let $adj\ A=\begin{bmatrix}4 & 0 & 2\\ 2 & 0 & -3\\ 3 & 4 & 5\end{bmatrix}$ and $B=\left(adj\ (adjA)\right)^T$, if $|A|=\alpha$ and $|B|=\beta$, then $\left|\frac{\sqrt{\beta}}{\alpha}\right|$ is:

(A) 1 **(B)** 8 **(C)** 64 **(D)** None of these

2. The set of all the values of 'a' for which the roots of the equation $(a-2)x^2-2ax+a=0$ lies in the interval $(-2,1)$.

(A) $a\in\left[0,\frac{8}{9}\right)\cup\{2\}$ **(B)** $a\in\left(0,\frac{8}{9}\right)\cup\{2\}$

(C) $a\in\left(0,\frac{8}{9}\right)$ **(D)** $\frac{29}{3}$

3. $\int\cot^{-1}\left(1-x+x^2-x^3+x^4-x^5+...\right)dx\ \ (|x|<1)$

(A) $(x+1)\tan^{-1}(x+1)-\log\sqrt{1+(x+1)^2}+C$

(B) $(x-1)\tan^{-1}(x+1)-\log\sqrt{1-(x+1)^2}+C$

(C) $(x+1)\tan^{-1}(x-1)+\log\sqrt{1+(x+1)^2}+C$

(D) $(x-1)\tan^{-1}(x-1)-\log\sqrt{1-(x-1)^2}+C$

4. If the term independent of x in the expansion of $\left(\frac{3}{2}x^2+\frac{2}{x}\right)^{12}$ is λ, then $\frac{\lambda}{81}$ is equal to

(A) 9900 **(B)** 7810 **(C)** 7920 **(D)** 7290

5. Mean and variance of 10 positive observations is 7 and 8. If we add 5 to each number then sum of mean and variance of new data is

(A) 15 **(B)** 20 **(C)** 25 **(D)** can't be determined

6. If $y(ydx+xdy)=x^3(xdy-ydx)$: $y(1)=1$ Then

(A) $2x=y(x^2+y^2)$ **(B)** $2y=x(x^2+y^2)$

(C) $2x=y(x^2-y^2)$ **(D)** $2y=x(x^2-y^2)$

7. Find $\mathrm{Re}(z)$, which satisfy $|z|=1$ and $z-\frac{2}{z}=1$

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

8. $\lim\limits_{x\to 9^-}\left[x^2+1\right]+\left[x^2-1\right]+\{x\}$ $\left[\text{Here}\left[\ .\ \right]\text{ is }GIF\text{ and }\{\ .\ \}\text{ is Fractional part function}\right]$

(A) 127 **(B)** 160 **(C)** 161 **(D)** 162

9. Let p, q, r be three statements such that the truth value of $\sim(\sim p\vee\sim q)\to(\sim q\vee r)$ is F. Then the truth values of p, q, r are respectively:

(A) T, F, T **(B)** T, T, T **(C)** F, T, F **(D)** T, T, F

10. Let S_1, S_2, S_3 be the sums of n terms of three series in A.P., the first term of each being 1 and the common differences 1, 2, 3, resp. If $S_1+S_3=\lambda S_2$ then the value of λ is:

(A) 1 **(B)** 2 **(C)** 3 **(D)** None of these

11. A chord is drawn from P(0, 4) to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1,(a>b,b<2)$ which intersects the major axis at M, foot of perpendicular from centre of ellipse to PM is N, Find PM.NP

(A) 4 **(B)** $2\sqrt{2}$ **(C)** 8 **(D)** 16

12. $\int_0^1 \frac{x^{13/2}}{\left(4-x^5\right)^{3/2}}dx$

(A) $\frac{5}{2}\left[\frac{1}{\sqrt{3}}-\frac{\pi}{6}\right]$ **(B)** $\frac{2}{5}\left[\sqrt{3}-\frac{\pi}{6}\right]$ **(C)** $\frac{2}{5}\left[\frac{1}{\sqrt{2}}+\frac{\pi}{6}\right]$ **(D)** $\frac{2}{5}\left[\frac{1}{\sqrt{3}}-\frac{\pi}{6}\right]$

13. If $\log_{(2x+3)}x^2<\log_{(2x+3)}(2x+3)$ then value of x

(A) $x\in\left[\frac{-3}{2},-1\right)\cup(1,3)$ **(B)** $x\in\left(\frac{-3}{2},-1\right)\cup(-1,3)-\{0\}$

(C) $x\in\left(\frac{-3}{2},-1\right]\cup[-1,3)$ **(D)** $x\in\left[\frac{-3}{2},-1\right]\cup(-1,3)$

14. If the surface area of a cube is increasing at a rate of $4.8cm^2/\text{sec.}$ retaining its shape, then the rate of change of its volume (in $cm^3/\text{sec.}$) when the length of a side of the cube is 15 cm is:

(A) 18 **(B)** 20 **(C)** 10 **(D)** 9

15. Angle between line joining two vertices of a regular tetrahedron to centroid is:

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

16. Difference between mean and variance of a binomial variate is '1' and difference between their square is '11'. Then probability of getting exactly three success is:

(A) ${}^{39}C_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^{36}$ **(B)** ${}^{36}C_3\left(\frac{1}{6}\right)^3\times\left(\frac{5}{6}\right)^{33}$

(C) ${}^{36}C_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^{33}$ **(D)** ${}^{36}C_3\left(\frac{5}{6}\right)^3\left(\frac{1}{6}\right)^{33}$

17. Straight line $3x+4y=12$ cuts the co-ordinate axis at point A and B respectively formed a triangle with axes. Then co-ordinate of excentre of triangle lie in IVth Quadrant is:

(A) $\left(\frac{13}{4},-\frac{13}{4}\right)$ **(B)** $(3,-3)$ **(C)** $(6,-6)$ **(D)** $(1,-1)$

18. If $n(A\cup B\cup C)+n(A\cup B\cup C)'=50,\ n(A)=10,\ n(B)=15\ n(C)=20,\ n(A\cap B)=5,$ $n(B\cap C)=6, n(C\cap A)=10, n(A\cap B\cap C)=5$, then the value of $n(A\cup B\cup C)'$

(A) 29 **(B)** 21 **(C)** 25 **(D)** 27

19. If the planes $x-cy-bz=0, cx-y+az=0$ *and* $bx+ay-z=0$ pass through a straight line, then the value of $a^2+b^2+c^2+2abc$ is:

(A) $-a$ **(B)** 0 **(C)** -1 **(D)** 1

20. Find minimum distance between the circle $x^2+(y-3)^2=1$ and parabola $y^2=4x$

(A) $\sqrt{2}$ **(B)** 1 **(C)** $\sqrt{2}-1$ **(D)** $\sqrt{2}+1$

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**.

21. Total number of 3-digit numbers whose product is 12 is _____.

22. Image of point (2, 1, 3) in the plane containing lines $\vec{r}=\hat{i}+\lambda\hat{j}$, $\vec{r}=\hat{i}+m\hat{k}$ (where, $\lambda, m\in R$) is (α,β,γ) then $(\alpha+\beta+\gamma)=$

23. If tangent to the curve $y=\log x$ *at* $\left(e^{\lambda},\lambda\right)$ and normal to the parabola $y^2=8x$ at $(2,4)$ cuts the *y* axis at the same point on T. Then λ is____.

24. If $2, a_1, a_2, a_3.....a_{10}, 5$ are in AP and $2, H_1, H_2, H_3.....H_{10}, 5$ are in H.P. then a_6H_5 is_____.

25. Let '*s*' be the set of all integral solutions of (x,y,z) the system of equations

$x-2y-6z=0$
$-2x+3y+9z=0$
$3x-5y-15z=0$

and $10\le x^2+y^2+z^2\le 200$ then number of element in the set '*s*'

26. Number of three digit numbers that can be formed by digits 1,2,3,4,5,6,7,8,9 such that number is divisible by 3. (Repetition of digits allowed)

27. $I=\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}}\left[\cos^3 x(1+\cos x)+\sin^3 x(1+\sin x)\right]dx$. Then $24I-18\pi=$

28. $\left(1+2x+3x^2+4x^3....\right)^{-2}=a_0+a_1x+a_2x^2+...a_nx^n$. Then $|a_0-a_1|=$

29. Number of solutions of the equation $\cot^{-1}x=1-|x|$ is_____.

30. $|z-i|=\mathrm{Im}(z)$ represents a conic with foci (α,β) then $\alpha+\beta=$

End of Mock JEE Main - 7