VMC Vidyamandir Classes SINCE 1986

IIT JEE | MEDICAL | FOUNDATION

CODE A

Mock JEE Main - 2 | 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

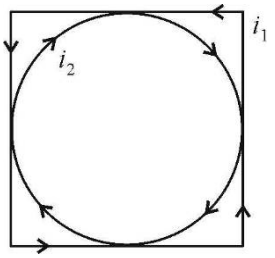
SECTION-1

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. A satellite is projected with a speed $\sqrt{\frac{5GM_e}{2R_e}}$ from a distance of $2R_e$ from the centre of the earth along radially outward direction. Find the speed of satellite when it reaches very far from earth. (M_e & R_e are mass and radius of earth)

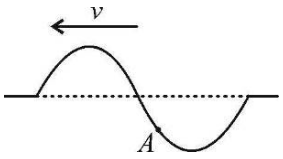
(A) $\sqrt{\frac{GM_e}{R_e}}$ **(B)** $\sqrt{\frac{3GM_e}{2R_e}}$ **(C)** $\sqrt{\frac{2GM_e}{R_e}}$ **(D)** Zero

2. A square loop and a circular loop are placed concentrically in the same plane as shown. Current in square loop is i_1 and that in circular loop is i_2 but in opposite sense. What should be the value of i_1 / i_2 such that magnetic field at centre is zero? (the two loops are insulated from each other)



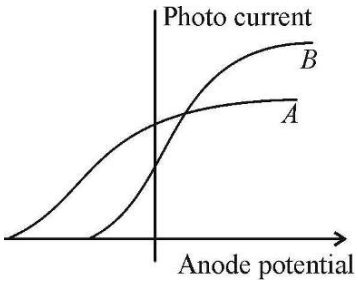
(A) $\frac{\pi}{\sqrt{2}}$ **(B)** $\frac{\pi}{2}$ **(C)** $\frac{\pi}{2\sqrt{2}}$ **(D)** $\frac{\pi}{4}$

3. On a wave pulse travelling towards left, there is a particle *A* as shown in the diagram. Referring to the particle A, choose the correct alternative.



(A) Velocity and acceleration of particle is towards mean position
(B) Velocity and acceleration of particle is towards extreme position
(C) Velocity of particle is towards mean position and its acceleration is towards extreme position
(D) Velocity of particle is towards extreme position and its acceleration is towards mean position

4. Figure shows the variation of photo current with anode potential for two different radiations *A* and *B* in the experiment of photo electric effect. Choose the correct option for radiation *A* and *B*.
[f_A, f_B are frequencies and I_A, I_B are intensities of radiations '*A*' and '*B*' respectively]

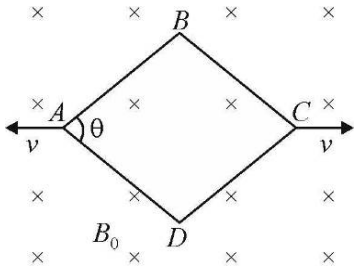


(A) $f_A > f_B$ **(B)** $f_A < f_B$
(C) $I_A > I_B$ **(D)** $I_A = I_B$

5. When a parallel plate capacitor is filled with wax after separation between plates is doubled, its capacitance becomes twice. What is the dielectric constant of wax?

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

6. Four conducting rods are hinged at the ends to create a rhombus of edge length ℓ. Magnetic field in the region is B_0 and perpendicular to the rhombus. Ends *A* and *C* are pulled in opposite direction with constant velocity *v*. Find electromotive force induced in the rhombus at the moment when the angle BAD is equal to θ.



(A) $\frac{B_0\ell v\sin\theta}{\sin\theta/2}$ **(B)** $\frac{B_0\ell v\cos\theta}{\cos\theta/2}$ **(C)** $\frac{2B_0\ell v\cos\theta}{\sin\theta/2}$ **(D)** $\frac{B_0\ell v\sin\theta}{\cos\theta/2}$

7. In a potentiometer experiment, two cells of emf E_1 and E_2 are used in series and the balancing length is found to be 72 cm. If polarity of E_2 is reversed, then the balancing length is found to be 54 cm. The ratio E_1 and E_2 of the cells will be:

(A) 1 : 1 **(B)** 3 : 1 **(C)** 5 : 1 **(D)** 7 : 1

8. A small roller of diameter 20 cm lies on a horizontal floor and a meter scale is positioned horizontally on it with one edge of the scale on top of it as shown in figure (i). The scale is now pushed slowly from the other end so that it moves without sliding on the axle and the roller starts rolling without slipping on the floor. After the roller has moved 40 cm, the length *l* of the scale that moves to the right of the roller as shown in figure (ii) is:

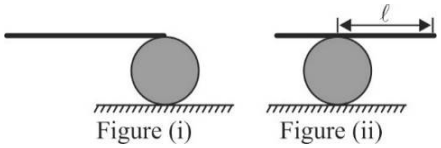


Figure (i) Figure (ii)

(A) 80 cm **(B)** 60 cm **(C)** 40 cm **(D)** 20 cm

9. A circular disc of radius *R* and thickness $\frac{R}{6}$ has moment of inertia I about its axis. If it is melted and casted into a solid sphere then what will be its moment of inertia, about its diametric axis?

(A) $\frac{I}{5}$ **(B)** $\frac{5I}{12}$ **(C)** $\frac{I}{10}$ **(D)** I

10. Two equal charges of value *q* are placed at a distance $2a$ and a charge $-2q$ is at their mid-point. The net electrostatic potential energy of the system is:

(A) 0 **(B)** $-\frac{3kq^2}{2a}$ **(C)** $-\frac{5kq^2}{2a}$ **(D)** $-\frac{7kq^2}{2a}$

11. The relationship between pressure (P) of the gas and average translational kinetic energy per unit volume (E) for a diatomic gas is:

(A) $P=\frac{2}{5}E$ **(B)** $P=\frac{3}{2}E$ **(C)** $P=E$ **(D)** $P=\frac{2}{3}E$

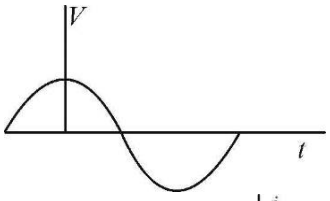
12. Mean life of a radioactive sample is t_0. What fraction of sample remains left after time $t_0 \ell n 2$?

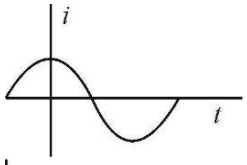
(A) $\frac{1}{4}$ **(B)** $\frac{1}{2}$ **(C)** $\frac{3}{5}$ **(D)** $\frac{2}{3}$

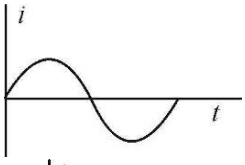
13. When a long capillary tube is immersed in water, mass *M* of water rises in capillary. What mass of water will rise in another long capillary of half the radius and made of same material?

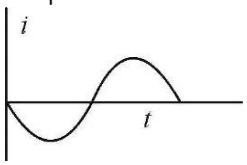
(A) M **(B)** $\frac{M}{2}$ **(C)** $\frac{M}{3}$ **(D)** $\frac{M}{4}$

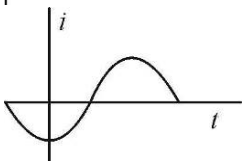
14. Voltage across a capacitor varies as shown in the diagram. Which diagram correctly represents the current time curve?



(A)


(B)


(C)


(D)


15. Time period (*T*) of oscillation of a liquid droplet depends on surface tension (*S*), radius (r) and density (ρ) of liquid. Then the expression of *T* is: (Here *k* is a dimensionless proportionality constant)

(A) $T = k\sqrt{\frac{r^3\rho}{S}}$ **(B)** $T = k\sqrt{\frac{S\rho}{r^3}}$ **(C)** $T = k\sqrt{\frac{r^3}{S\rho}}$ **(D)** $T = k\sqrt{\frac{r^3 S}{\rho}}$

16. Two identical containers each of volume V_0 are joined by a small pipe. The containers contain identical gases at temperature T_0 and pressure P_0. One container is heated to temperature $2T_0$ while maintaining the other at the same temperature T_0. The final common pressure of gas in the two containers will be:

(A) P_0 **(B)** $\frac{3}{4}P_0$ **(C)** $\frac{4}{3}P_0$ **(D)** $2P_0$

17. A gate has following truth table (*P* and *Q* are input and *R* is output).

P	1	1	0	0
Q	1	0	1	0
R	1	0	0	0

The gate is:

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

18. In a Young's double slit experiment, the fringe width is β and the intensity at the central maxima is I_0.

Then, the intensity at a point at a distance $\frac{\beta}{4}$ from the central maxima is:

(A) $\frac{I_0}{4}$ **(B)** $\frac{I_0}{2}$ **(C)** $\frac{3}{4}I_0$ **(D)** $2I_0$

19. A light wave is travelling along $+y$ axis. At a particular point on a given time, electric field vector is along + x axis then the magnetic field vector is directed along:

(A) $-z$ axis **(B)** $+z$ axis **(C)** $-y$ axis **(D)** $+y$ axis

20. If an electron is moving with velocity v in an orbit of radius r then the equivalent magnetic field at the centre will be:

(A) $\frac{\mu_0 ev}{r^2}$ **(B)** $\frac{\mu_0 ev}{2r}$ **(C)** $\frac{\mu_0 ev}{4\pi r^2}$ **(D)** $\frac{\mu_0 e}{2r}$

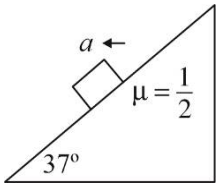
SECTION-2

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. Coefficient of thermal expansion of a wire varies with temperature T as $\alpha = 1.6\times10^{-6}T$, where T is temperature in degree Celsius. If the length of wire is 10 m at 0ºC, what is the change in length of wire (in mm), when its temperature is raised to 25ºC?

22. Two discs of moment of inertia $9kgm^2$ and $3kgm^2$ were rotating with angular velocity 6 rad/sec and 10 rad/sec respectively in same direction. They are brought together gently to move with same angular velocity. The loss of kinetic energy in Joules is_____.

23. A block is placed on an inclined plane of inclination 37° and coefficient of friction $\frac{1}{2}$. What maximum horizontal acceleration (in m/s^2) can we give to plane so that the block does not slip on the plane? (Take g = 10 m/sec^2)



24. A lens is placed between a source of light and screen. It forms real image on screen for two different positions. If height of one image is 20 cm and the other is 80 cm, then the height of source of light (in cm) is_____.

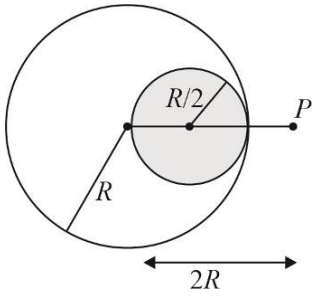
25. Force required to separate two glass plates of area $100cm^2$ with a thin film of water 0.05 cm thick between them is____. (in N). (Surface tension of water is $70\times10^{-3}N/m$, consider complete wetting)

26. A source of sound S is moving with a velocity of 50 m/s towards a stationary observer. The observer measures the frequency of the source as 1000 Hz. What will be the apparent frequency (in Hz) of the source when it is moving away from the observer after crossing him? (Take speed of sound in air as 350 m/s)

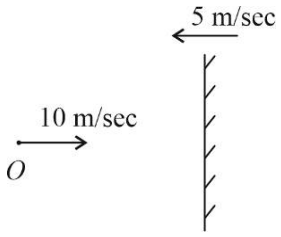
27. When a light ray is incident on a medium of refractive index 4/3, reflected light is found to be 100% polarized. What is the angle of refraction in degrees? $\left(\tan 53° = \frac{4}{3}\right)$

28. The magnetic field intensity due to a very small bar magnet having magnetic dipole moment as $2.5\,Am^2$ at end on position at a distance of $0.5\,m$ in μT is_____.

29. A uniformly charged solid sphere having charge –9 coulomb and radius $\frac{R}{2}$ is placed inside a uniformly charged non conducting spherical shell of radius *R* and charge *Q* as shown in the figure. Find the value of *Q* (in coulomb), such that net electric field at *P* is zero_____.



30. An object is moving towards a moving mirror as shown in the figure. Find speed of image with respect to ground in m/sec.



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. Which type of soap contains fillers like sodium rosinate, sodium silicate, borax and sodium carbonate?

(A) Toilet Soaps **(B)** Medicated Soaps

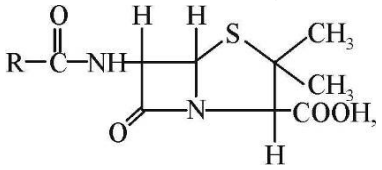
(C) Laundry Soaps **(D)** Normal Soaps

2. What will be the name of atomic number 114 according to the IUPAC nomenclature and its symbol respectively is:

(A) Unnunnquadium, Uuq **(B)** Ununnquastium, Uut

(C) Ununquadium, Uuq **(D)** Ununquadium, Uud

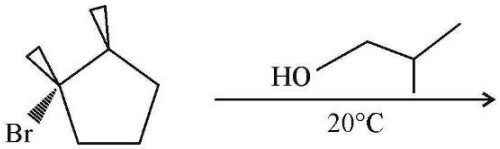
3. The structure given below is a general structure of a drug used as:

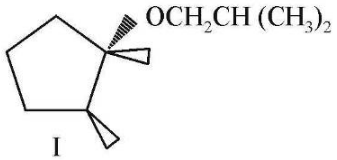


(A) Antifertility drugs **(B)** Antiseptics drugs

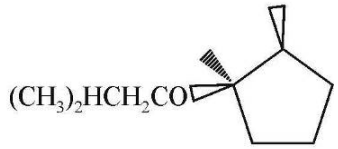
(C) Disinfectant drugs **(D)** Antibiotic drugs

4. What would be the major products of the following reaction?

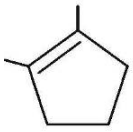




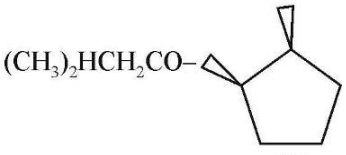
I



II



III



IV

(A) IV **(B)** I & II **(C)** III **(D)** I, II and III

5. The pollutants which come directly in the air from sources are called primary pollutants. Primary pollutants are sometimes converted into secondary pollutants. Which of the following belongs to secondary air pollutants?

(A) CO **(B)** Hydrocarbon

(C) Peroxyacetyl nitrate **(D)** NO

6. Which of the following statement is true for an ideal solution?

(A) The solute and solvent both obey Raoult's Law

(B) The solute obeys Raoult's Law and the solvent obey's Henry's Law

(C) The solute obeys Henry's Law and the solvent obeys Raoult's Law

(D) The solute and solvent both obey Henry's Law

7. How many electrons per mole of Pt are transferred when aqua regia oxidized platinum?

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

8. How would you expect the bond strength to change in the series C_2 to C_2^- to C_2^{2-}?

(A) gets stronger than weaker **(B)** gets Weaker

(C) gets stronger **(D)** gets weaker than stronger

9. Consider a solution consisting of the following two buffer systems.

$H_2CO_3 \rightleftharpoons HCO_3^- + H^+$ pKa = 6.4

$H_2PO_4^- \rightleftharpoons HPO_4^{2-} + H^+$ pKa = 7.2

At pH = 6.4, which one of the following is true for the concentration of acid and conjugate base present.

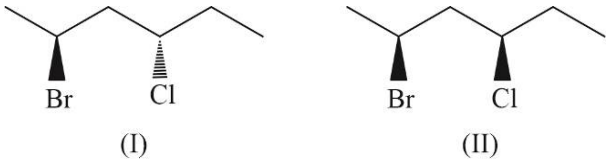
(A) $[H_2CO_3] > [HCO_3^-] \& [H_2PO_4^-] > [HPO_4^{2-}]$

(B) $[H_2CO_3] = [HCO_3^-] \& [HPO_4^{2-}] > [H_2PO_4^-]$

(C) $[HCO_3^-] > [H_2CO_3] \& [HPO_4^{2-}] > [H_2PO_4^-]$

(D) $[H_2CO_3] = [HCO_3^-] \& [H_2PO_4^-] > [HPO_4^{2-}]$

10. Structures I & II are:



(I) (II)

(A) Constitutional isomers **(B)** Enantiomers

(C) Identical **(D)** Diastereomers

11. Which of the following complexes can exhibit optical isomerism? $(en = H_2N - CH_2 - CH_2 - NH_2)$

(A) $cis - [Co(NH_3)_4 Cl_2]$ **(B)** $[Co(NH_3)_3 Cl_3]$

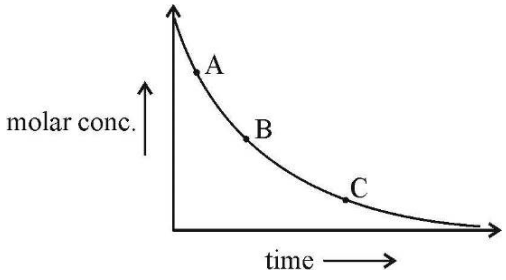
(C) $cis - [Co(en)_2 Cl_2]$ **(D)** $trans - [Co(en)_2 Br_2]$

12. The concentration-time dependence for a 1st order reaction is as shown in the graph:

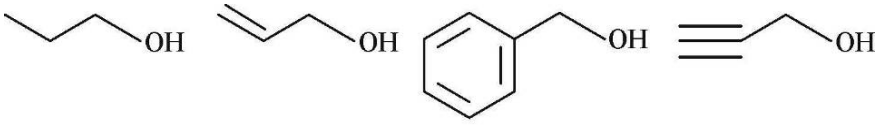
At which point on the curve, the rate of reaction is fastest?

(A) B **(B)** A

(C) C **(D)** All point have same rate



13. Arrange the following on the increasing order of acidic hydrogen.



(I) (II) (III) (IV)

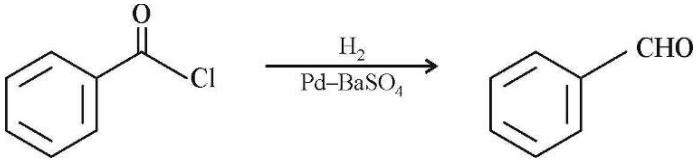
(A) I < II < III < IV **(B)** IV < III < II < I **(C)** I < III < IV < II **(D)** III < IV < II < I

14. Which of the following is an example of Stephen reaction?

(A) $RCN \xrightarrow[2.H_2O]{1.A\ell H(i-Bu)_2} R-CHO$

(B) $CH_3(CH_2)_9-\overset{\overset{O}{\|}}{C}-OC_2H_5 \xrightarrow[2.H_2O]{1.DIBAL-H} CH_3(CH_2)_9-\overset{\overset{O}{\|}}{C}-H$

(C) $R-CN + SnCl_2 + HCl \longrightarrow RCH=NH \xrightarrow{H_3O^+} RCHO$

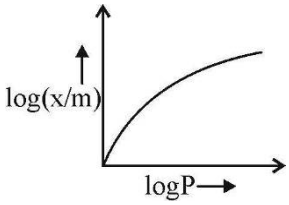
(D) 

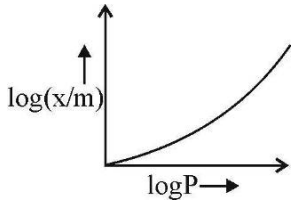
15. What is the formula and method of preparation of Hypophosphoric oxyacid?

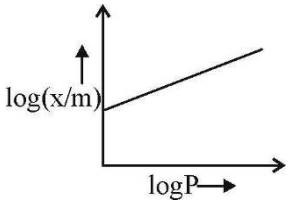
(A) $H_4P_2O_6$, white P_4 + alkali **(B)** $H_4P_2O_5$, red P_4 + alkali

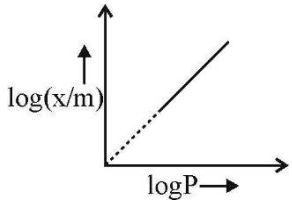
(C) $H_4P_2O_5$, white P_4 + alkali **(D)** $H_4P_2O_6$, red P_4 + alkali

16. Which of the following curves is in accordance with Freundlich adsorption isotherm?

(A) 

(B) 

(C) 

(D) 

17. For which of the following complexes is the order of values of Δ_0 correct?

(A) $\left[Rh(NH_3)_6\right]^{3+} > \left[Co(NH_3)_6\right]^{3+}$ **(B)** $\left[Fe(CO)_6\right]^{4-} > \left[Fe(CN)_6\right]^{3-}$

(C) $\left[Cr(H_2O)_6\right]^{2+} > \left[Cr(H_2O)_6\right]^{3+}$ **(D)** $\left[CrF_6\right]^{3-} > \left[Cr(CN)_6\right]^{3-}$

18. Out of the following oxides of nitrogen how many of them are neutral oxides?

N_2O, NO, N_2O_3, NO_2, N_2O_4, N_2O_5

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

19. The principle involved in paper chromatography is:

(A) Adsorption **(B)** Partition **(C)** Solubility **(D)** Volatility

20. The purpose of salt bridge is to:

(A) Allow electron flow **(B)** All chemical reduction

(C) Allow chemical oxidation **(D)** Allow ion flow

SECTION-2

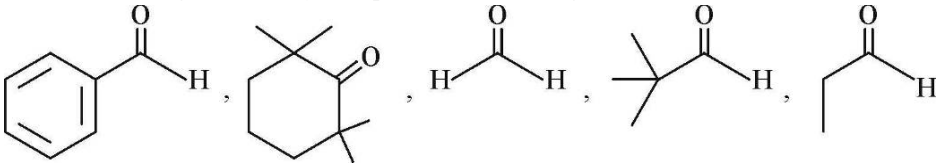
Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted.
The answer to each question is a NUMERICAL VALUE. For each question, enter the correct numerical value of the answer. If the answer is a decimal numerical value, then round-off the value to 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, ⊖ sign should be bubbled*. (Example: 6, 81, 1.50, 3.25, 0.08)

21. $C_2H_5OH + KMnO_4 \rightarrow HC_2H_3O_2 + MnO_2 + KOH + H_2O$ is the unbalanced equation if 5g of ethanol & excess amount of aqueous $KMnO_4$ are reacted and 5.5g of $HC_2H_3O_2$ result. What is the percent yield in the nearest integer? [Given: Atomic mass of H = 1, C = 12, O = 16]

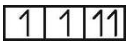
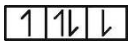
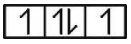
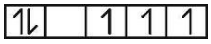
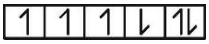
22. A face-centered cubic unit cell contains 8 'X' atoms at the corners of the cell and 6 'Y' atoms at the faces. If the empirical formula of the solid is X_aY_b then, what is $\frac{b}{a}$?

23. Calculate the strength in g/L of 10 volume solution of hydrogen peroxide at 273 K and 1 bar pressure. [Report your answer divided by 10]

24. Of the following, how many compounds can undergo aldol reaction?



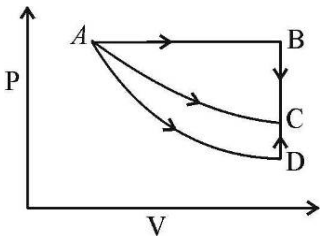
25. Shown below are portions of orbital diagrams representing the ground state electron configuration of certain elements. If 'x' of them violates Pauli exclusion principle and 'y' of them violates Hund's Rule then what is 'x' multiplies 'y'?

(a) 
(b) 
(c) 
(d) 
(e) 
(f) 

26. Determine the freezing point (nearest integer) of a 1 mole kg^{-1} aqueous solution of a weak electrolyte that is 7.5% dissociated into two ions (in °C) [Given K_f of water is 1.86 °C/m].

27. How many total moles of electrons are transferred when 1 mole of $Cr_2O_7^{2-}$ oxidized Fe^{2+} to Fe^{3+} in acidic medium?

28.



In the above diagram if a systems from initial state A (P_1, V_1, T_1) goes to final state C (P_2, V_2, T_1) from 3 different paths:
Path 1 is A to C, Path 2 is A to B to C, Path 3 is A to D to C
If 5 kJ of work is done by system in Path A to C then how much heat is transferred during Path A to D is:

29. Which of the following species is polar?

$CO_2, BF_3, XeF_2, ClF_3, NH_3, N(SiH_3)_3, XeF_4, H_2O$

30. Which of the following orbitals are valid?

1s, $2p_x$, $3d_{x^2-z^2}$, $4p_z$, $2p_y$, $3d_{x^2}$, $2d_{x^2-y^2}$, $4d_{z^2}$

SPACE FOR ROUGH 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. $\int e^x \frac{1+10x^9-x^{20}}{\left(1-x^{10}\right)\sqrt{1-x^{20}}}dx$ is equal to: (where c is an integral constant)

(A) $e^x\left(\frac{1-x^{10}}{1+x^{10}}\right)+c$ **(B)** $e^x\left(\frac{1+x^{10}}{1-x^{10}}\right)+c$

(C) $e^x\left(\sqrt{\frac{1+x^{10}}{1-x^{10}}}\right)+c$ **(D)** $e^x\left(\sqrt{\frac{1-x^{10}}{1+x^{10}}}\right)+c$

2. If $e^{x+y}=y^2$ then $\frac{d^2y}{dx^2}$ at (–1, 1) is equal to:

(A) 2 **(B)** 1 **(C)** –1 **(D)** 0

3. If $\cos\alpha, \sin\beta, \sin\alpha$ are in increasing G.P., then roots of $x^2+2\cot\beta.x+1=0$ are: (where $\alpha, \beta \in R$)

(A) Real and distinct **(B)** both positive

(C) Real and equal **(D)** Imaginary

4. If a denotes the number of permutation of n different things taken all at a time, b the number of permutation of $n-2$ different things taken 10 at a time and c, the number of permutations of $n-12$ different things taken all at a time such that $a=182bc$, then value of n is:

(A) 10 **(B)** 12 **(C)** 14 **(D)** 18

5. In a test an examinee either guesses, copies or knows the answer to multiple choice question with five choices. The probability that he makes a guess is $\frac{1}{4}$ and probability that he copies the answer is $\frac{1}{8}$. The probability that his answer is correct given that he copies is $\frac{1}{10}$. Find the probability that he knows the answer to the question given that he correctly answered it:

(A) 1 **(B)** $\frac{10}{11}$ **(C)** $\frac{1}{2}$ **(D)** $\frac{12}{19}$

6. The value of $\int_{-20\pi}^{20\pi}[\sin x+\cos x]dx$ is: (where [.] denotes greatest integer function)

(A) 10π **(B)** -20π **(C)** 20π **(D)** -10π

7. Which of the following statement is a tautology?

(A) $(p\vee r)\vee\sim(p\wedge q)$ **(B)** $(\sim p\wedge q)\vee(\sim p\vee q)$

(C) $\sim[(p\vee q)\wedge\sim q]$ **(D)** $(p\to q)\wedge(q\to r)$

8. If a, b, c are real, then $f(x)=\begin{vmatrix} x+a^2 & ab & ac \\ ab & x+b^2 & bc \\ ac & bc & x+c^2 \end{vmatrix}$ is decreasing in:

(A) $\left(-\frac{2}{3}\left(a^2+b^2+c^2\right),0\right)$ **(B)** $\left(0,\frac{2}{3}\left(a^2+b^2+c^2\right)\right)$

(C) $\left(0,\frac{a^2+b^2+c^2}{3}\right)$ **(D)** No where

9. Three distinct numbers a_1, a_2, a_3 are in increasing G.P. $a_1^2+a_2^2+a_3^2=364$ and $a_1+a_2+a_3=26$, then the value of a_{10} if a_n is the n^{th} term of the given G.P. is:

(A) 2.3^9 **(B)** 3^9 **(C)** 2.3^{10} **(D)** 3^{12}

10. If a conic passes through (1, 0) and satisfies differential equation $(1+y^2)dx-xy\,dy=0$. Then the equation of circle which is touching this conic at $\left(\sqrt{2},1\right)$ and passing through one of its foci is:

(A) $x^2+y^2-3\sqrt{2}x-y+4=0$ **(B)** $x^2+y^2-\sqrt{2}x-y+1=0$

(C) $x^2+y^2-\sqrt{2}x-3y+1=0$ **(D)** $x^2+y^2-3\sqrt{2}x-3y+4=0$

11. If $f(x)=\frac{e^{[x]+|x|}-3}{[x]+|x|+1}$, then: (where [.] represents greatest integer function)

(A) $\lim\limits_{x\to 0^+} f(x)=-2$ **(B)** $\lim\limits_{x\to 0^-} f(x)=0$ **(C)** $\lim\limits_{x\to 0^-} f(x)=2$ **(D)** $\lim\limits_{x\to 0} f(x)$ exist

12. If normal at any point P to ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1(a>b)$ meet the x & y axes at A and B respectively. Such that $\frac{PA}{PB}=\frac{3}{4}$, then eccentricity of the ellipse is:

(A) $\frac{1}{3}$ **(B)** $\frac{1}{2}$ **(C)** $\frac{1}{4}$ **(D)** $\frac{1}{9}$

13. $f(x)=\begin{cases} 1+\cos^{-1}\{\cot x\}, & x<\frac{\pi}{2} \\ \pi[x]+1\ , & x\geq\frac{\pi}{2} \end{cases}$

Where [ ] denotes greatest integer and { } denotes fractional part function, Then value of jump of discontinuity is:

(A) $\frac{\pi}{2}$ **(B)** $\frac{\pi}{2}-1$ **(C)** 0 **(D)** $1-\frac{\pi}{2}$

14. The mean square deviation of a set of m observations $y_1, y_2 \ldots . y_m$ about a point K is defined as $\frac{1}{m}\sum_{i=1}^{m}\left(y_i-k\right)^2$. The mean square deviation about -3 and 3 are 16 and 8 respectively, then standard deviation of this set of observation?

(A) $\frac{\sqrt{23}}{3}$ **(B)** $\sqrt{7}$ **(C)** $\frac{\sqrt{41}}{3}$ **(D)** $\frac{\sqrt{38}}{3}$

15. Let the plane $2x-3y+9z=0$ is *P*, the equation of line passing through $(0,1,-1)$ and lying-in plane $4x-2y+7z+9=0$ & parallel to *P* is:

(A) $\frac{x}{-3}=\frac{y-1}{2}=\frac{z+1}{8}$ **(B)** $\frac{x}{-3}=\frac{y-1}{22}=\frac{z+1}{8}$

(C) $\frac{x-1}{-3}=\frac{y-1}{2}=\frac{z+1}{8}$ **(D)** $\frac{x}{-3}=\frac{y-1}{11}=\frac{z+1}{4}$

16. If p^{th}, q^{th}, r^{th}, terms of a G.P. are the positive numbers *a, b, c* respectively then angle between the vectors $\log a^3\hat{i}+\log b^3\hat{j}+\log c^3\hat{k}$ and $(q-r)\hat{i}+(r-p)\hat{j}+(p-q)\hat{k}$ is:

(A) $\frac{\pi}{2}$ **(B)** $\frac{\pi}{3}$ **(C)** 0 **(D)** $\sin^{-1}\left(\frac{1}{\sqrt{p^2+q^2+r^2}}\right)$

17. *PQ* is a double ordinate of the parabola $y^2=4ax$. Tangents are drawn to parabola at *P* and *Q*, which meets the *y* axis at *S, R* respectively. If area of trapezium *PQRS* is equal to $24a^2$, then angle subtended by *RS* at the focus of parabola is:

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

18. In a triangle, difference of base angles is 60° and has a base of length 4cm and area is equal to 12 cm^2, if angle opposite to base is θ, then which of the following is correct? (θ is acute angle).

(A) $3\sin\theta-4\cos\theta=\frac{1}{2}$ **(B)** $3\sin\theta-\cos\theta=1$

(C) $\theta\in\left(\frac{\pi}{12},\frac{\pi}{6}\right)$ **(D)** $\theta\in\left(\frac{\pi}{3},\frac{\pi}{2}\right)$

19. Let $P=\{x:x\in R,|x|<2\}$

$Q=\{x:x\in R,|x-1|\geq 2\}$

$P\cup Q=R-S$ then set S is: (where *R* is the set of real numbers)

(A) $[-2,2]$ **(B)** $[2,3]$ **(C)** $[2,3)$ **(D)** $(-1,2]$

20. A ray of light coming along the line $\frac{x-1}{1}=\frac{y-2}{2}=\frac{z-3}{3}$, strikes the plane mirror kept along the plane through points (2, 1, 1), (3, 0, 2) and $(2,-1,-1)$. Then the equation of reflected ray is:

(A) $\frac{x-3}{1}=\frac{y-3}{5}=\frac{z-2}{-5}$ **(B)** $\frac{x-3}{1}=\frac{y-3}{5}=\frac{z-2}{10}$

(C) $\frac{x-1}{1}=\frac{y-2}{5}=\frac{z-3}{-5}$ **(D)** $\frac{x-3}{1}=\frac{y-2}{5}=\frac{z-2}{10}$

SECTION-2

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21. The number of values of x satisfying
$2^{\log_5 16.\log_4 x+\log_{\sqrt{2}} 5}+5^x+x^{(\log_5 4)+5}+x^5=0$

22. The equation $z^2-(3+i)z+(m+2i)=0$ $m\in R$, has exactly one real and one non real complex root, then product of real root and imaginary part of non-real complex root is:

23. If the value of $\lim\limits_{n\to\infty} n^{-n^2}\left((n+1)\left(n+\frac{1}{3}\right)\left(n+\frac{1}{3^2}\right).....\left(n+\frac{1}{3^{n-1}}\right)\right)^n$ is e^k then k is:

24. Find number of integral values of k for which the line $3x+4y-k=0$, lies between the circles $x^2+y^2-2x-2y+1=0$ and $x^2+y^2-18x-12y+113=0$, without cutting a chord on either of circle.

25. The number of solution of matrix equation $X^2=\begin{pmatrix}1 & 1\\ 2 & 3\end{pmatrix}$ is:

26. The number of solutions of equation $2\tan^{-1}(x+1)=\cos^{-1}\left(\frac{x}{2}\right)$.

27. Coefficient of x^4 in the expansion $\left(1+x-x^2\right)^5$ is k then $|k|$.

28. A point $P(x,y)$ moves in in xy plane in such a way that $\sqrt{2}\le|x+y|+|x-y|\le 3\sqrt{2}$. Area of region representing all possible position of point P is equal to:

29. Consider $f(x)=\int_1^x\left(t+\frac{1}{t}\right)dt$ and $g(x)=f'(x)$ for $x\in\left[\frac{1}{2},3\right]$. If P is a point on the curve $y=g(x)$ such that the tangent to curve at P is parallel to a chord joining the points $\left(\frac{1}{2},g\left(\frac{1}{2}\right)\right)$ and $\left(3,g(3)\right)$ of the curve, then if ordinate of point P is λ then $\sqrt{6}\lambda$ is equal to:

30. Let $\Delta=\begin{vmatrix}-bc & b^2+bc & c^2+bc\\ a^2+ac & -ac & c^2+ac\\ a^2+ab & b^2+ab & -ab\end{vmatrix}$ and the equation $px^3+qx^2+rx+s=0$ has roots a, b, c, where $a,b,c\in R^+$, then if $\Delta=27$ and $a^2+b^2+c^2=2$ find $\frac{\sqrt{2}p}{q}+1$.

End of Mock JEE Main-2