ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)

CLASSROOM CONTACT PROGRAMME

(Academic Session : 2021 - 2022)

TARGET : JEE (M + A) : 2022

ENTHUSIAST SRG TEST SERIES

TEST TYPE: ONLINE | **DATE : 18.07.2021** | **PATTERN : JEE ADVANCED**

Time : 3 Hours | **Maximum Marks : 198**

TEST - 4 (PAPER 2)

INSTRUCTIONS

READ THE INSTRUCTIONS CAREFULLY

QUESTION PAPER FORMAT AND MARKING SCHEME

1. The question paper has **three parts** : **PHYSICS**, **CHEMISTRY** and **MATHEMATICS**. Each part has **THREE SECTIONS**.
2. Carefully read the instructions given at the beginning of each section.
3. **Section I(i):** This section contains **SIX** questions. The answer to each question is a **ONLY ONE CORRECT OPTION.**

   Marking scheme : +3 for correct answer, 0 if not attempted and –1 in all other cases.
4. **Section I(ii):** This section contains **SIX** questions. The Answer to each question is a **ONE OR MORE THAN ONE CORRECT OPTIONS**.

Marking scheme :	+4	for correct answer, 0 if not attempted and –2 in all other cases.
Partial Marks :	+3	If all the four options are correct but ONLY three options are chosen.
Partial Marks :	+2	If three or more options are correct but ONLY two options are chosen, both of which are correct options.
Partial Marks :	+1	If two or more options are correct but ONLY one option is chosen and it is a correct option.
5. **Section II:** This section contains **SIX** questions. The answer to each question is a **NUMERICAL VALUE**.

   Marking scheme : +3 correct answer, 0 if not attempted and 0 in all other cases.

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SOME USEFUL CONSTANTS	
Atomic No.	H = 1, B = 5, C = 6, N = 7, O = 8, F = 9, Al = 13, P = 15, S = 16, Cl = 17,Br = 35, Xe = 54, Ce = 58,
Atomic masses :	H = 1, Li = 7, B = 11, C = 12, N = 14, O = 16, F = 19, Na = 23, Mg = 24, Al = 27, P = 31, S = 32, Cl = 35.5, Ca = 40, Fe = 56, Br = 80, I = 127, Xe = 131, Ba = 137, Ce = 140,

- **Boltzmann constant** $k = 1.38 \times 10^{-23}\ JK^{-1}$
- **Coulomb's law constant** $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$
- **Universal gravitational constant** $G = 6.67259 \times 10^{-11}\ N\text{–}m^2\ kg^{-2}$
- **Speed of light in vacuum** $c = 3 \times 10^8\ ms^{-1}$
- **Stefan–Boltzmann constant** $\sigma = 5.67 \times 10^{-8}\ Wm^{-2}\text{–}K^{-4}$
- **Wien's displacement law constant** $b = 2.89 \times 10^{-3}\ m\text{–}K$
- **Permeability of vacuum** $\mu_0 = 4\pi \times 10^{-7}\ NA^{-2}$
- **Permittivity of vacuum** $\epsilon_0 = \frac{1}{\mu_0 c^2}$
- **Planck constant** $h = 6.63 \times 10^{-34}\ J\text{–}s$

ENTHUSIAST SRG TEST SERIES

TEST - 4 (PAPER 2)	DATE : 18 - 07 - 2021

SYLLABUS

PHYSICS	: Electrostatics, Gravitation, Current Electricity, Thermal Physics, Circular Motion, Work Power Energy
CHEMISTRY	: General Organic Chemistry (GOC), Isomerism, Hydrocarbon, Alkyl Halides & Aryl Halides, EAS
MATHS	: Functions ITF, LCD MOD, Conic Section (2 Tests)

PART-1 : PHYSICS

SECTION–I(i) : (Maximum Marks : 18)

- This section contains **SIX** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, **Both inclusive**.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks : +3 If only the bubble corresponding to the correct answer is darkened.
Zero Marks : 0 In all other cases.
Negative Marks : –1 In all other cases.

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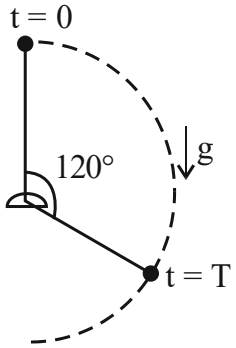
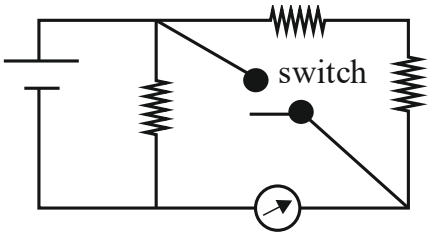
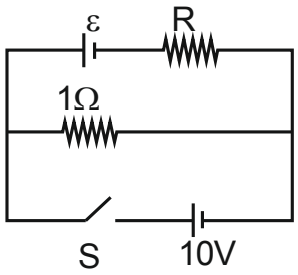
1. A light rod pendulum (small bob of mass m, length *l*) is released from rest from it's topmost position with a negligible push at t = 0. By t = T it swings through an angle of 120° in the vertical plane. At this instant bob loses contact with the rod suddenly without changing its velocity. The magnitude of change in vertical component of acceleration of the bob just before t = T to just after t = T is $\frac{ng}{4}$, then n is



2. In the circuit shown, the reading of Ammeter is doubled after the switch is closed. Each resistor has resistance $= 1\Omega$ and the ideal cell has an e.m.f = 10 V. Then the resistance of an ammeter in Ω will be

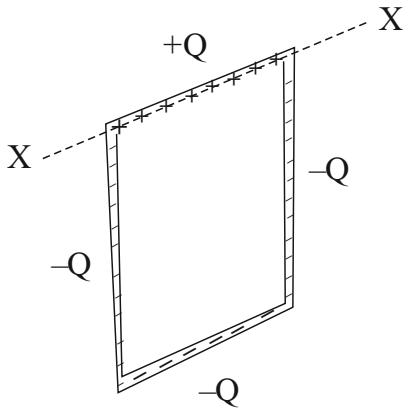


3. The power dissipated in resistor R is 16R watt, whether the switch S is closed or open. The unknown e.m.f ε in the circuit is _____ (V)



4. Consider ΔABC of three wires BC, CA and AB of same uniform cross-section and same material having resistance are a, b and c respectively in ohms. Another wire from A of resistance $d = 5\Omega$ can make a sliding contact with BC (say point P). A battery of constant emf $\varepsilon = 4V$ is connected between A and point of contact with BC (point P). Further it is known that value of d is equal to sum of the three resistance a, b and c. The minimum current drawn from the battery is i_0 in amperes. Find the value i_0.

5. Square frame ABCD is made of four thin rods, each of length L mass m and charged as shown in the figure the frame is hanging from one of its sides as shown in figure along the horizontal axis XX. At t = 0 electric field is switched on in horizontal direction perpendicular to plane of the frame, the minimum value of electric field so that the square frame rotates up to horizontal level is $\frac{nm}{Q}g$ then n is



6. A satellite revolves in an equatorial plane in west to east direction around the earth with a period of 6 hours. At an instant it is observed vertically overhead a longitude, after how much minimum time will the satellite again be overhead the same longitude? (answer is hours)

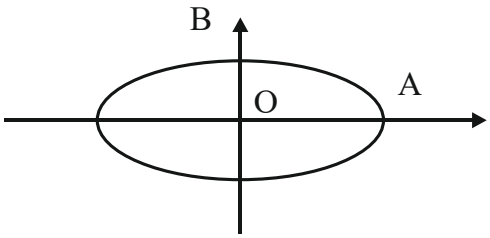
SECTION–I(ii) : (Maximum Marks : 24)

- This section contains **SIX** questions.
- Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).
- For each question, choose the correct option(s) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks	: +4	If only (all) the correct option(s) is (are) chosen.
Partial Marks	: +3	If all the four options are correct but ONLY three options are chosen.
Partial Marks	: +2	If three or more options are correct but ONLY two options are chosen, both of which are correct options.
Partial Marks	: +1	If two or more options are correct but ONLY one option is chosen and it is a correct option.
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered).
Negative Marks	: –2	In all other cases.

- **For Example :** If first, third and fourth are the **ONLY** three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(s) (second option in this case), with or without selection of any correct option(s) will result in –2 marks.

7. A particle is moving on elliptical path with constant speed v. The semi major axis minor axis are a and b respectively



Select incorrect statement

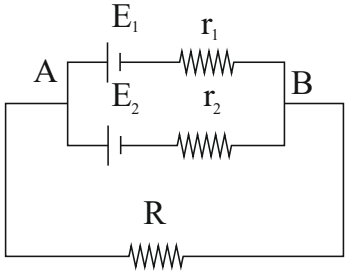
(A) Time taken to make complete revolution is $\frac{\pi(a+b)}{v}$

(B) Acceleration of the particle at A is more than acceleration of the particle at B

(C) Acceleration of the particle is always towards O

(D) Average velocity of the partial journey from A to B is less than v.

8. Two batteries of emf E_1 internal resistance r_1 and E_2 internal resistance r_2 are connected in parallel and makes a battery system. An external resistance R is connected across this system as shown in figure.



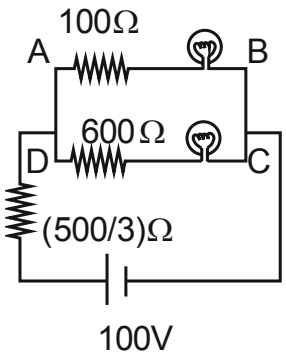
(A) If R is infinite the equivalent emf of system across A and B is $\frac{E_1r_1+E_2r_2}{r_1+r_2}$

(B) If R is infinite the equivalent emf of system across A and B is $\frac{E_1r_2+E_2r_1}{r_1+r_2}$

(C) The current in external circuit is given as $\frac{\frac{E_1r_2+E_2r_2}{r_1+r_2}}{R+\frac{r_1r_2}{r_2+r_1}}$

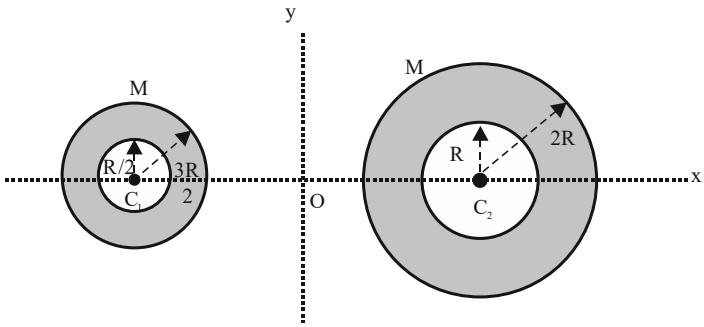
(D) The current in external circuit is given as $\frac{\frac{E_1}{r_1}+\frac{E_2}{r_2}}{1+\frac{R}{r_1}+\frac{R}{r_2}}$

9. Two bulbs 25 watt 100 volt and 100 watt 200 volt are connected in the circuit as shown in the figure choose the correct answer (s).



(A) Heat lost per second in the circuit will be 80 J
(B) Ratio of heat produced per second in bulbs will be 1 : 1
(C) Ratio of heat produced in branch AB to Branch CD will be 2 : 1
(D) Current drawn from the cell is 0.2 amp

10. Consider two uniform hollow spheres each of mass M (as shown in figure.), their centers are fixed at $C_1(-3R,0,0)$ and $C_2(+3R,0,0)$. Which of the following option is true for the given system?



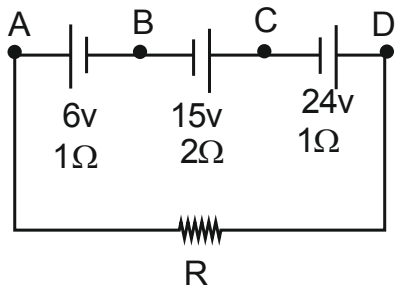
(A) Work done by gravitational force in moving a mass m from C_1 to C_2 is $\frac{12GMm}{13R}$

(B) If a particle of a mass m placed at origin is slightly displace along y axis and released then it will perform SHM with frequency $\frac{1}{2\pi}\sqrt{\frac{2GM}{27R^3}}$

(C) If a particle is moving on a path $y^2+z^2=16R^2$ under the effect of gravitational force only then its time period is $10\pi\sqrt{\frac{5R^3}{2GM}}$

(D) All points on yz plane have same potential

11. In the given circuit the point A is 8V higher than point B



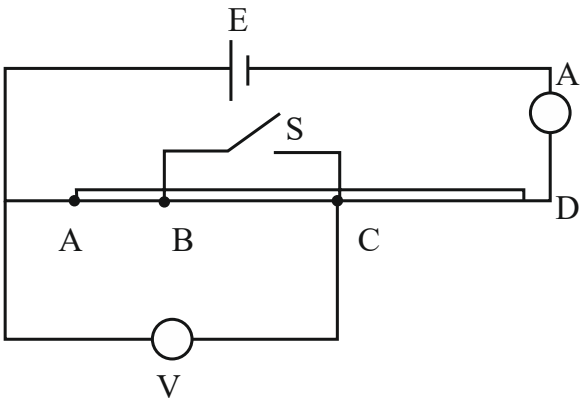
(A) $R=12.5\Omega$

(B) $R=7\Omega$

(C) Potential difference between B and D is 33V

(D) Potential difference between B and C is 15V

12. Figure shows a uniform wire AD of length 60 cm connected to an ideal cell, ideal voltmeter and an ideal ammeter. AB = 10 cm, BC = 30 cm. The other connecting wires are resistance less. The reading of the voltmeter and the ammeter when switch 'S' is closed 8V and 1A respectively



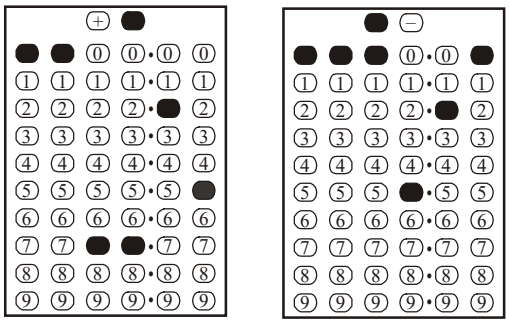
The switch 'S' is opened then the reading of the voltmeter will be :

(A) 12 volts (B) 8 volts

(C) 16 volts (D) 18 volts

SECTION-II : (Maximum Marks: 24)

- This section contains **SIX** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. 6.25, 7.00, –0.33, –.30, 30.27, –127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct) by darken the corresponding bubbles in the ORS.
  For Example : If answer is –77.25, 5.2 then fill the bubbles as follows.

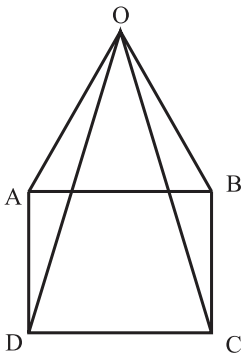


- Answer to each question will be evaluated according to the following marking scheme:
  Full Marks : +4 If ONLY the correct numerical value is entered as answer.
  Zero Marks : 0 In all other cases.

13. A point charge Q at rest inside a thin fixed neutral metallic spherical shell of radius R, but is not at its centre. If net force experienced by the charge when its distance from center of shell is R/3 is $\left(NKQ^2/64R^2\right)$ then N is

14. A Satellite is moving in an elliptical orbit with the semi major axis equals to 24571 km. If the apogee height is 35786 km find height of perigee. (Radius of planet is 6378 km).
If answer is 30n km then n is

15. (OABCD) pyramid of square base of side '2a' and height 'a' is uniformly charged with charge density $\rho\left(C/m^3\right)$. If potential at the tip 'o' is V_0 . Find potential at the vertices of cube of charge density $\rho\left(C/m^3\right)$ and side 'a'. If answer is nV_0 then n is



16. The co-efficient of thermal expansion of a rod is temperature dependent and is given by the formula $\alpha = aT$, where $a = \frac{1}{2}\ln 2\ ^\circ C^{-2}$ and T in °C. If length of the rod is l at temperature 0 °C, then the temperature (in °C) at which the length will be $2l$ is :

17. A resistance of 2Ω is connected across one gap of a metre-bridge and unknown resistance, greater than 2Ω , is connected across the other gap. When these resistance are interchanged, the balance point shifts by 20 cm, neglecting any end correction, the unknown resistance is in ohm.

18. A bicyclist comes to a skidding stop in 10 m. During this process, the force on the bicycle due to the road is 200 N and is directly opposite to the motion. The work done by the cycle on the road is

PART-2 : CHEMISTRY

SECTION–I(i) : (Maximum Marks : 18)

- This section contains **SIX** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, **Both inclusive**.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- For each question, marks will be awarded in one of the following categories :

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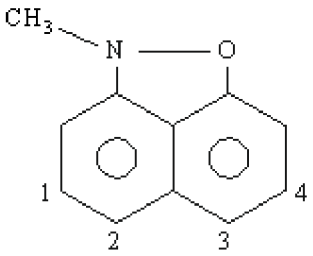
1. Identify the position where EAS reaction takes place predominantly

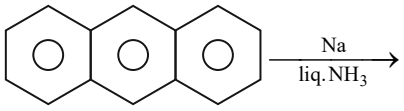


2. A certain metal when illuminated alternatively by light of $\lambda_1 = 155\,\text{nm}$ and $\lambda_2 = 310\,\text{nm}$ emit photoelectrons of maximum kinetic energies in the ratio 5 : 1. The work function of the metal in eV is [Take hc = 1240 eV nm]

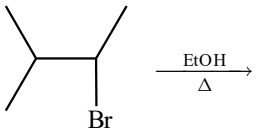
3. 4.3 gm of an alkane (A) is burnt in sufficient oxygen. The CO_2 formed reacts completely with 300 ml, 2N NaOH solution producing Na_2CO_3. The alkane (A) would be C_xH_y. The value of (y – x) is

4. The ratio of the e/m values of a proton and an $\alpha-$particle is $x : y$, then what is the value of $(x + y)$

5. Degree of unsaturation of the major product formed in the following reaction is:



6.



Total no. of elimination products possible in the above reaction are (including stereoisomers) -

SECTION–I(ii) : (Maximum Marks : 24)

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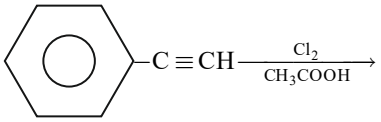
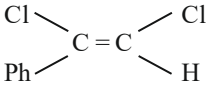
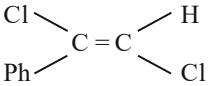
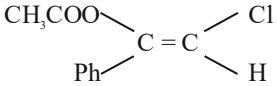
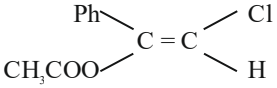
7. The products formed in the following reactions is (are)-



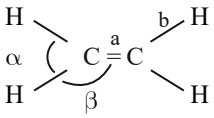
(A) 

(B) 

(C) 

(D) 

8. Which of the following with respect to ethene is(are) **CORRECT**



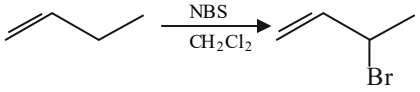
(A) $\alpha > \beta$

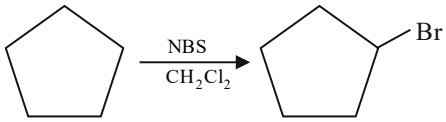
(B) $\beta > \alpha$

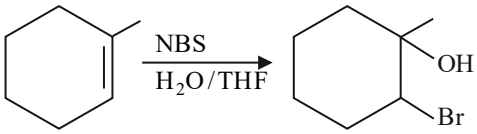
(C) $a > b$

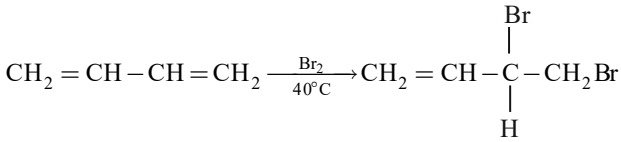
(D) $b > a$

9. Which of the following reactions is/are **CORRECT** with respect to major product?

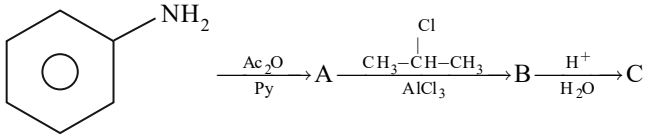
(A) 

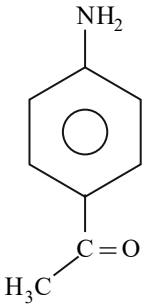
(B) 

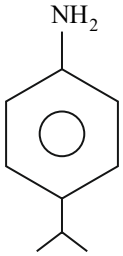
(C) 

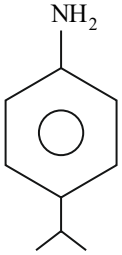
(D) 

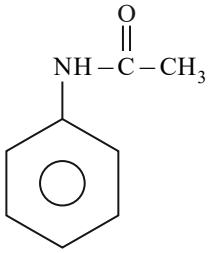
10. Which of the following is(are) **CORRECT** with repect to the given reaction (major product in all cases)



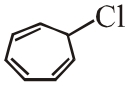
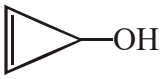
(A) A is 

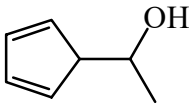
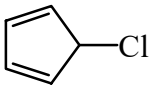
(B) B is 

(C) C is 

(D) A is 

11. Which of the reaction(s) among following produces aromatic compound ?

(A)  (B) 

(C)  (D) 

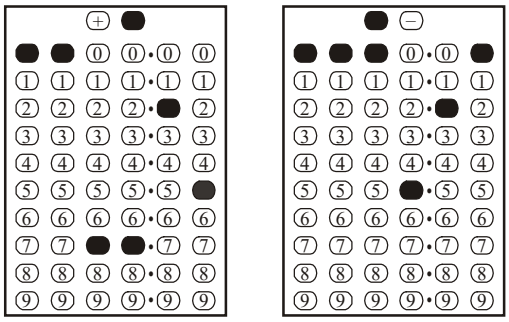
12. Which of the followings are **NOT CORRECT** about the maximum probability of finding electron in the d_{xy} orbital?

(A) Along the x axis (B) Along the y axis

(C) At an angle of 45° from the x and y axis (D) At an angle of 90° from the x and y axis

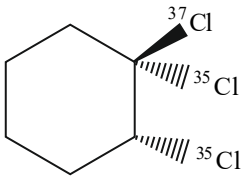
SECTION-II : (Maximum Marks: 24)

- This section contains **SIX** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. 6.25, 7.00, –0.33, –.30, 30.27, –127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct) by darken the corresponding bubbles in the ORS.
  For Example : If answer is –77.25, 5.2 then fill the bubbles as follows.



- Answer to each question will be evaluated according to the following marking scheme:
  Full Marks : +4 If ONLY the correct numerical value is entered as answer.
  Zero Marks : 0 In all other cases.

13. Atomic mass of the isotope of Cl (in u) attached to the ring (alkene) when the molecule undergo dehalogenation with NaI/Acetone



14. Polyethene can be prepared by CaC_2 by the following sequence of reactions.

$CaC_2 + H_2O \rightarrow CaO + C_2H_2$

$C_2H_2 + H_2 \rightarrow C_2H_4$

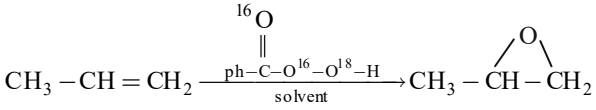
$nC_2H_4 \rightarrow (C_2H_4)_n$ (Polyethene)

The mass in kg of polythene that can be prepared by 20 kg CaC_2. (Give : GAM of Ca = 40g)

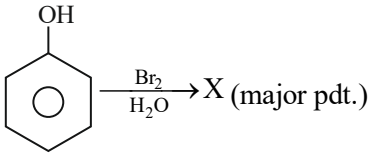
15. The ionisation potential of a hydrogen like species is 36 eV. What is the value of excitation energy from ground state to 2nd excited state (in eV) .

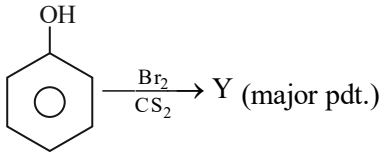
16. When electron will jump from 2nd Bohr's orbit to 1st Bohr's orbit of hydrogen atom then wave number = $\bar{v}_1$ and jumps from 3rd to 2nd then corresponding wave number is = $\bar{v}_2$. Now, $\bar{v}_1 - \bar{v}_2$ will be xR_H , so the value of x is (Upto 2 decimal places)-

17. Gram atomic mass of the isotope of oxygen (in g) which forms the epoxide in the following reaction



18. Observe the following reactions:





If the molar mass of X is A grams and the molar mass of Y is B grams, then the value of B-A is (in grams) (Given: GAM of Br = 80, O = 16, C = 12, H = 1)

PART-3 : MATHEMATICS

SECTION–I(i) : (Maximum Marks : 18)

- This section contains **SIX** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, **Both inclusive**.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks : +3 If only the bubble corresponding to the correct answer is darkened.
Zero Marks : 0 In all other cases.
Negative Marks : –1 In all other cases.

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1. The number of point where $f(x)=\sqrt{\cos((2x+1)\pi)+1}\ (x^2-1)\ (x^2-4)\ (e^x-1)$ is not differentiable and $x\in[-4,4]$

2. Number of point(s) of discontinuity of the function $f(x)=[x^{1/x}]$, $x>0$ where [.] represents GIF is

3. If $A=\begin{bmatrix}5 & -6\\ 1 & -1\end{bmatrix}$ then the value of $\frac{\det(A^m-5A^{m-1})}{\det(A^n-5A^{n-1})}(m,n\in N)$ is

4. Let A be a square matrix of order 3 satisfying $A^3-6A^2+12A-8I=0$ and $B=A-2I$. If $|\text{adj}\ (I-2A^{-1})|=K$, then [K] .... where [.] represents GIF

5. Let p(x) be a polynomial of degree 6 with leading coefficient unity and $p(-x)=p(x)\ \forall x\in R$. Also $(p(1)+3)^2+(p(2))^2+(p(3)-5)^2=0$ then $\sqrt{-4-p(0)}$ is ...

6. In triangle ABC if the median to side BC has length $\left(11-6\sqrt{3}\right)^{\frac{-1}{2}}$ and it divides angle $\angle A$ into angles 30° and 45°. Then length of side BC is ___

SECTION–I(ii) : (Maximum Marks : 24)

- This section contains **SIX** questions.
- Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).
- For each question, choose the correct option(s) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks	: +4	If only (all) the correct option(s) is (are) chosen.
Partial Marks	: +3	If all the four options are correct but ONLY three options are chosen.
Partial Marks	: +2	If three or more options are correct but ONLY two options are chosen, both of which are correct options.
Partial Marks	: +1	If two or more options are correct but ONLY one option is chosen and it is a correct option.
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered).
Negative Marks	: –2	In all other cases.

- **For Example :** If first, third and fourth are the **ONLY** three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(s) (second option in this case), with or without selection of any correct option(s) will result in –2 marks.

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7. If the equation $\left(2^{\left(\frac{1}{\cos^{-1}x}\right)}\right)^{2\pi}-\left(a+\frac{1}{2}\right)\left(2^{\left(\frac{1}{\cos^{-1}x}\right)}\right)^{\pi}-a^2=0$ has only one real solution then subsets of values of 'a' are

(A) $(-3, 1)$ (B) $(-\infty,-3]$

(C) $[1,\infty)$ (D) $[-3,\infty)$

8. Let $a=\sin^{-1}(\sin 3)+\sin^{-1}(\sin 4)+\sin^{-1}(\sin 5)$, $f(x)=e^{x^2+|x|}$, domain of f(x) be $[a,\infty)$ and range of f(x) be $[b,\infty)$ and $g(x)=\left(4\cos^4 x-2\cos 2x-\frac{1}{2}\cos 4x-x^7\right)^{1/7}$, domain and range of g(x) is set of real numbers. Which of the following is/are correct?

(A) $a=-2$ (B) $a+b=-1$

(C) $f(g(g(b)))=e^2$ (D) Both f(x), g(x) are non invertible functions

9. If $\alpha(\theta),\theta\in R$ and $\beta(\theta),\theta\in R-\left\{2n\pi-\frac{\pi}{2},n\in I\right\}$ are functions satisfying $(1+x)\sin^2\theta-(1+x^2)\sin\theta+(x-x^2)=0$ then which of the following is/are correct?

(A) $\lim\limits_{\theta\to 0^+}\left\{(\alpha(\theta))^{\frac{1}{\sin\theta}}+(\beta(\theta))^{\frac{1}{\sin\theta}}\right\}=\frac{1}{e^2}$ (B) $\ell n(\beta(\theta))$ is an odd function

(C) $\lim\limits_{\theta\to 0}\left(\sum\limits_{r=1}^{n}r^{\frac{1}{\alpha^2(\theta)}}\right)^{\alpha^2(\theta)}=n,n\in N,n\geq 2$ (D) $\lim\limits_{\theta\to\pi/2}\frac{\alpha(\theta)-(\alpha(\theta))^{\alpha(\theta)}}{1-\alpha(\theta)+\ell n(\alpha(\theta))}=2$

10. Consider a curve $x^3 + 3xy + y^3 = 1$. If 3 distinct points A, B, C are choosen on it to form a ΔABC, then

(A) Exactly one equilateral Δ is possible

(B) Exactly two triangles ABC can be made which are isosceles

(C) Area of an equilateral ΔABC is $\frac{3\sqrt{3}}{2}$

(D) If an isosceles ΔABC is made it is right angled also

11. A and B are non singular square matrices of same order with real entries such that $tr(AA^T - AB^TA^T) = tr(ABA^T - ABB^TA^T)$, then which of the following is/are true:

(A) $tr(A - AB) \neq 0$

(B) $A^T = B^TA^T$

(C) Sum of all elements of matrix A – AB is an odd number

(D) B must be an identity matrix if A is invertible matrix

12. Let P be any point on the line $x - y + 3 = 0$ and A be a fixed point (3, 4). If the family of lines given by the equations $(3\sec\theta + 5\,\text{cosec}\,\theta)x + (7\sec\theta - 3\,\text{cosec}\,\theta)y + 11(\sec\theta - \text{cosec}\,\theta) = 0$ are concurrent at a point B for all permissible value of θ, then;

(A) Sum of the abscissa and ordinate of point B is equal to – 1

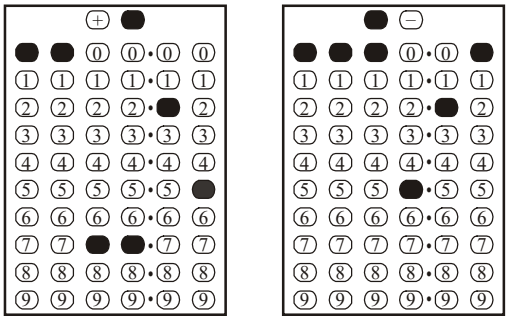
(B) Product of the abscissa and ordinate of point B is equal to – 2

(C) Maximum value of $|PA - PB|$ is $2\sqrt{10}$

(D) Minimum value of PA + PB is $2\sqrt{34}$

SECTION-II : (Maximum Marks: 24)

- This section contains **SIX** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. 6.25, 7.00, –0.33, –.30, 30.27, –127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct) by darken the corresponding bubbles in the ORS.
  For Example : If answer is –77.25, 5.2 then fill the bubbles as follows.



- Answer to each question will be evaluated according to the following marking scheme:
  Full Marks : +4 If ONLY the correct numerical value is entered as answer.
  Zero Marks : 0 In all other cases.

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13. Let $P(x) = 100\,x^n + a_{n-1}\,x^{n-1} + ... + a_1x + a_0 \;\forall\; a_i \in R;\, 0 \le i \le n-1$. Let $\alpha_1, \alpha_2, \alpha_3, ...\alpha_n$ be its n roots such that $\prod_{i=2}^{n}(\alpha_1 - \alpha_i) = K(K \in R - \{0\})$. If $L = \lim_{x\to\alpha_1}(1+P(x))^{\frac{1}{x-\alpha_1}}$ where α_1 is a real root, then find the value of $\frac{\ell nL}{K}$

114. Let $S_n = \sum_{x=1}^{n} x!;\, n \ge 6,\; T = \sin^{-1}\left(\sin\left(S_n - 7\left[\frac{S_n}{7}\right]\right)\right)$. If $\int_0^1 \frac{T}{\sqrt{1-x^2}}dx = \frac{a\pi}{b} - \pi^c$ where $a, b, c \in W; b \ne 0$ then find $\left(\frac{b}{c} + a\right)$ and (a, b are co-prime numbers and [.] represents G.I.F.)

15. Let E and M be 3 × 3 matrices satisfying the system of equations
$(EM)^T = 20I$ and $(E + M)^T = 17(E - M)^T$
Where I denotes identity matrix of order 3.

If $E^2 + M^2 = \frac{a}{b}I$ (where a and b are co-prime), then find the value of (a + b)

16. Let $f(x) = \left[x - \frac{1}{4}\right] + x[x] + |x(x-4)\sin x| + (2x-1)^{1/3}$. Find the number of points in $[0, 2\pi]$ where f(x) is non-derivable (Note [.] denotes greatest integer function)

17. The value of the expression

$$\tan\left(\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{2}{9}\right) + \tan^{-1}\left(\frac{1}{8}\right) + \tan^{-1}\left(\frac{2}{25}\right) + \tan^{-1}\left(\frac{1}{18}\right) + ...\infty\right) \text{ is}$$

18. If the value of $\lim_{x\to 0}\frac{\ell n(1+\sin^3 x\cos^2 x)\cot(\ell n^3(1+x))\tan^4 x}{\sin(\sqrt{x^2+2}-\sqrt{2}).\,\ell n(1+x^2)} = \sqrt{n}$ where $n \in N$, then find the value of n