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Test Pattern

ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)

CLASSROOM CONTACT PROGRAMME

(Academic Session : 2024 - 2025)

JEE(Main)
PART TEST
15-12-2024

JEE(Main+Advanced) : ENTHUSIAST COURSE (SCORE-I)

Time : 3 Hours

PAPER-1 (OPTIONAL)

Maximum Marks : 300

IMPORTANT NOTE : Students having 8 digits **Form No.** must fill two zero before their Form No. in OMR. For example, if your **Form No.** is 12345678, then you have to **fill 0012345678.**

READ THE INSTRUCTIONS CAREFULLY

Important Instructions :

1. Immediately fill in the form number on this page of the Test Booklet with Blue/Black Ball Point Pen. Use of pencil is strictly prohibited.
2. The candidates should not write their Form Number anywhere else (except in the specified space) on the Test Booklet/Answer Sheet.
3. The Test Booklet consists of **75** questions.
4. There are **three** parts in the question paper 1,2,3 consisting of **Physics**, **Chemistry** and **Mathematics** having **25 questions** in each subject and each subject having **Two sections.**
   (i) Section-I contains 20 multiple choice questions with **only one correct** option.
   Marking scheme : +4 for correct answer, 0 if not attempted and –1 in all other cases.
   (ii) Section-II contains 05 **Numerical Value Type** questions.
   Marking scheme : +4 for correct answer, 0 if not attempted and –1 in all other cases.
5. No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electronic device etc, except the Identity Card inside the examination hall/room.
6. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
7. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Room/Hall. **However, the candidate are allowed to take away this Test Booklet with them.**
8. **Do not fold or make any stray marks on the Answer Sheet.**
9. **Take g = 10 m/s² unless otherwise stated.**

DO NOT BREAK THE SEALS WITHOUT BEING INSTRUCTED TO DO SO BY THE INVIGILATOR

Name of the Candidate (in Capitals) _____

Form Number : in figures _____

: in words _____

Centre of Examination (in Capitals) : _____

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

Your Target is to secure Good Rank in JEE(Main) 2025

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PART-1 : PHYSICS

SECTION-I : (Maximum Marks: 80)

This section contains **20 questions**. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) **Only one option is correct**. For each question, marks will be awarded as follows:

Full Marks : +4 If correct answer is selected.

Zero Marks : 0 If none of the option is selected.

Negative Marks : –1 If wrong option is selected.

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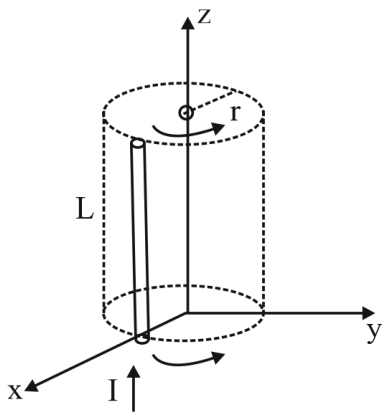
1. Find the work and power required to move the conductor shown in figure, one full turn in the positive direction at a rotational frequency of N revolutions per minute, if $B = B_0\hat{r}$, where $\hat{r}$ is radially outward from the axis of the cylinder shown.



(A) Work = $4\pi r B_0 I L$

(B) Work = $2\pi r B_0 I L$

(C) Power = $-\frac{2\pi r B_0 I L N}{60}$

(D) Power = $-\frac{4\pi r B_0 I L N}{60}$

2. A solenoid with $N_1 = 1000$, $r_1 = 1.0$ cm, and $\ell_1 = 50$ cm is concentric within a second coil of $N_2 = 2000$, $r_2 = 2.0$ cm, and $\ell_2 = 50$ cm. Find the mutual inductance assuming free-space conditions.

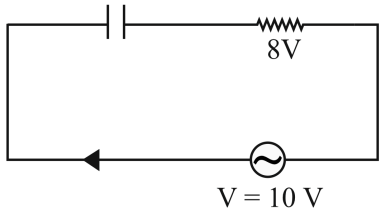
(A) 1.58 mH

(B) 2.53 mH

(C) 3.20 mH

(D) 4.65 mH

3. **Assertion (A) :** KVL rule is applicable in AC circuit shown below.



Reason (R) : V_C (Voltage across capacitor) in the circuit = 2V

(Take all voltages shown as RMS)

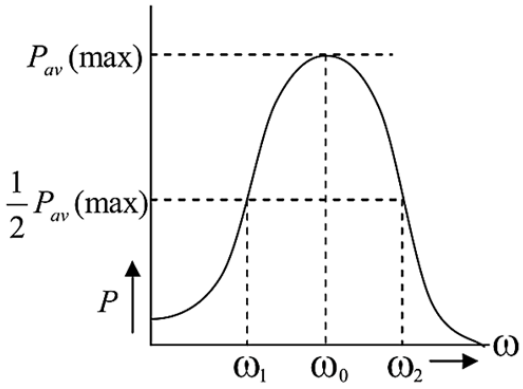
(A) Both the assertion and reason are true and reason is a true explanation of the assertion.

(B) Both the assertion and reason are true but the reason is not true the correct explanation of the assertion.

(C) Assertion is true but Reason is false.

(D) Both the Assertion and Reason are false.

4. The below graph shows the average power P_{av} against the frequency of the driving force acting on an oscillator.



Consider the following statements:

(1) The sharpness of the peak at resonance is determined by the damping constant.

(2) The sharpness of resonance is defined by $\frac{\omega_2 - \omega_1}{\omega_0}$.

(3) The peak occurs at the frequency of velocity resonance when the power absorbed by the oscillator from the driving force is maximum.

Which of these statements are **correct**?

(A) (1) and (2) (B) (2) and (3)

(C) (1) and (3) (D) (1), (2) and (3)

5. An object of mass 2 kg hangs from a spring of negligible mass and spring constant of 800 N/m. The spring is extended by 2.5 cm when the object is attached. The top end of the spring is oscillated up and down in SHM with an amplitude of 2 mm. The damping constant is $\gamma = 0.5\ \text{sec}^{-1}$. The amplitude of forced oscillations (in cm) when forced frequency is equal to natural frequency, is :-

(A) 1 (B) 2

(C) 3 (D) 4

6. In a damped forced oscillation, if the damping coefficient b is increased, what is the effect on the resonant frequency ω_r compared to the natural frequency ω_0?

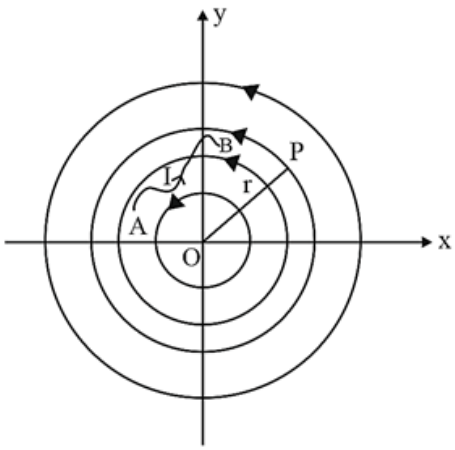
(A) $\omega_r = \omega_0$

(B) $\omega_r < \omega_0$

(C) $\omega_r > \omega_0$

(D) ω_r is independent of b

7. The magnitude of the field in a two dimensional x-y plane, is inversely proportional to distance from the origin and field at point P has magnitude given by $B = \frac{K}{r}$, where K is positive constant. A wire carrying current I is laid in xy plane with its ends at point A(−1, +1) and point B(1, 3). Then force on wire AB is :-



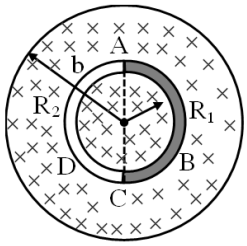
(A) $\frac{KI\ell n5}{2}$

(B) $\frac{KI\ell n2}{2}$

(C) $\frac{KI\ell n2}{5}$

(D) $\frac{KI\ell n5}{5}$

8. A uniform magnetic field B exists perpendicular to the plane of the Figure in a circular region of radius b with its centre at O. A circular conductor of radius a (< b) and centre at O is made by joining two semicircular wires ABC and ADC. The two segments have same cross section but different resistances 10 Ω and 5 Ω respectively. The magnetic field is increased with time and there is an induced current in the conductor.



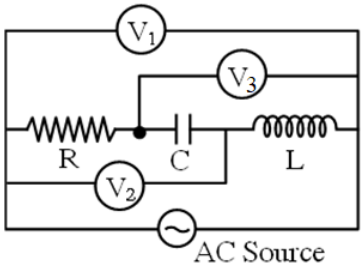
(A) The ratio of electrostatic fields inside the conductors ABC and ADC is 3.

(B) The ratio of electrostatic fields inside the conductors ABC and ADC is 1 : 2.

(C) Charge accumulated at junction A is negative and that is at C is Positive.

(D) Potential difference between A and C is half of the total EMF induced in the ring.

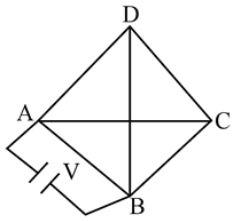
9. Three A.C. voltmeters are connected in a circuit as shown in figure. Reading of voltmeters are, $V_1 = 260$ V, $V_2 = 125$ V and $V_3 = 240$ V. All voltmeters are drawing negligible current from the circuit. Find the ratio of inductive reactance to capacitive reactance. Assuming circuit is more inductive.



(A) 0.24 (B) 4.2 (C) 4.00 (D) 1.25

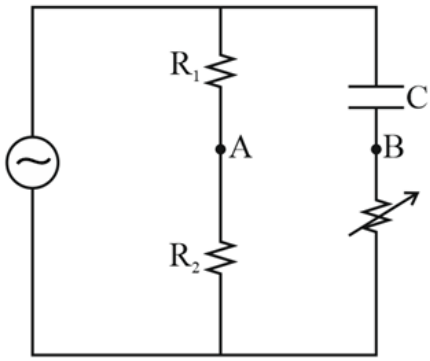
10. A regular tetrahedron is made of constant resistance per unit length 'λ'. The length of each side is ' ℓ '. An ideal cell of emf 'V' is connected across AB. The magnitude of the magnetic field due to the wire 'ABC' at the centroid of the triangle ABC is _____ tesla. (consider only the contribution of triangle ABC)

(Given : λ = 2 Ω/m, ℓ = 1 m, V = 10 volts)



(A) 0 (B) 2 (C) 4 (D) 8

11. Circuit shown consists of two resistance R_1 and R_2 of equal and fixed value, a variable R, a capacitor C and an alternating voltage source. If the variable resistance is made to vary over a wide range than :-



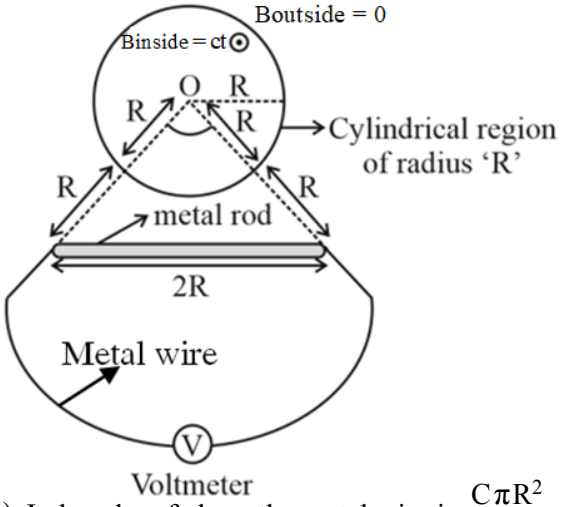
(A) Peak voltage between A and B is uniform when R changes from 0 to ∞.

(B) Peak voltage between A and B is first decrease then increase when R changes from 0 to ∞.

(C) Peak voltage between A and B is increasing continuously when R changes from 0 to ∞.

(D) Peak voltage between A and B is decreasing continuously when R changes from 0 to ∞.

12. For the given figure which options is **not correct?**



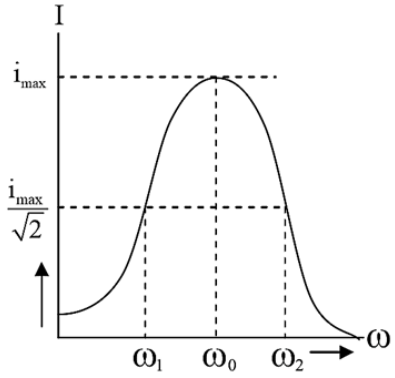
(A) Induced emf along the metal wire is $\frac{C\pi R^2}{6}$.

(B) induced electric field is non zero outside the cylinder.

(C) Deflection shown by the voltmeter is zero.

(D) Deflection shown by the voltmeter is non-zero.

13. For a series LCR circuit given graph drawn between current i and angular frequency of AC source applied. Then which option is **incorrect** ?



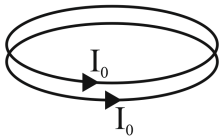
(A) At resonance, angular frequency $\omega_r = \sqrt{\omega_1\omega_2}$.

(B) When $\omega = \omega_2$ then source voltage lead by $\frac{\pi}{4}$ from circuit current.

(C) When $\omega = \omega_r$ then power factor of circuit is 1.

(D) When $\omega = \omega_1$ then power factor of circuit is $\frac{\sqrt{3}}{2}$.

14. Two identical superconducting rings are co-axially placed vary close (infinitesimally small separation) to each other. Each of the coils has inductance L and carries a current I_0 in the same direction. Mutual induction between two loops is L then choose **incorrect** alternative. (Take the mutual inductance of the system to be equal to L initially)



(A) Current in each coil is $2I_0$ when separation between them is infinitely large.

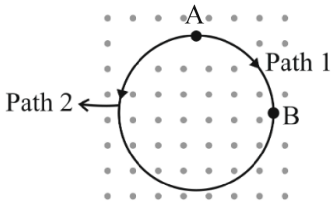
(B) Flux linked with each coil remains same when they are at infinitely large.

(C) Minimum work done by an external agent has to be done in making their separation infinitely large is $2LI_0^2$.

(D) Current in each coil remains same when they are at large separation.

15. **Statement-I :** In a region of time varying magnetic field two charges of same magnitude moves A to B in clockwise and anticlockwise manner. Work done in clockwise path is not equal to work done in anticlockwise path.

Statement-II : Work done in electrostatic field is independent of path.



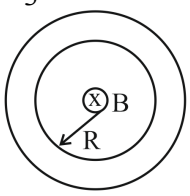
(A) Both statement are true but statement-II is correct explanation of statement-I.

(B) Both statement are true but statement-II is not correct explanation of statement-I.

(C) Statement I is true but statement II is false.

(D) Both the statements I and II are false.

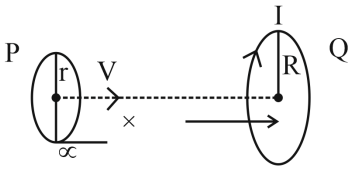
16. Friction coefficient between a ring of mass m & radius R and ground is μ. Find time when ring will start rotating if charge density on ring is λ & magnetic field $B = \frac{t^3}{3}$ throughout the radius r > R.



(A) $\sqrt{\frac{\mu mg}{\lambda R^2 \pi}}$ (B) $\sqrt{\frac{\mu mg}{3\lambda R^2 \pi}}$

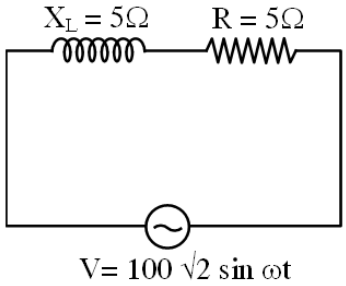
(C) $\sqrt{\frac{\mu mg}{2\lambda R^2 \pi}}$ (D) $\sqrt{\frac{2\mu mg}{\lambda R^2 \pi}}$

17. Loop P of radius (r << R) moves towards loop Q with a constant velocity 'v' in such a way that their planes are always parallel. At what separation between the two loops is the induced emf in loop P maximum? [Given: v = 10 m/s, R = 4 m]



(A) 4m (B) 2m (C) 1m (D) 0.5m

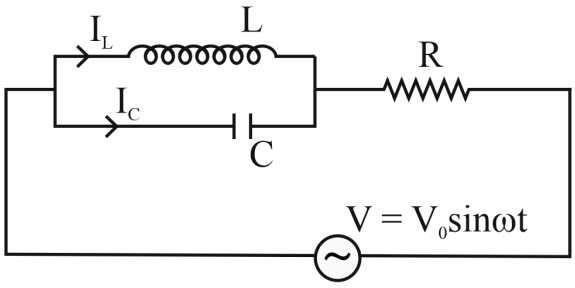
18. Find potential difference across inductor at time when P.D. across source becomes half of maximum.

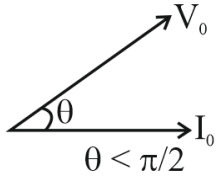


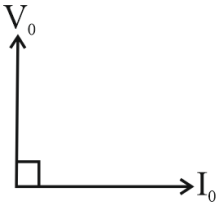
(A) 96.5 V (B) 100 V

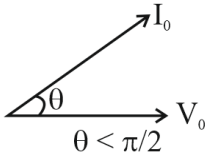
(C) $50\sqrt{2}$V (D) $25\sqrt{2}$V

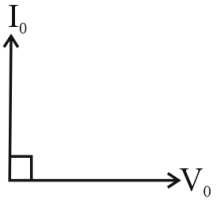
19. Correct phasor diagram for below AC circuit is (Given: $I_L > I_C$) [$I_0 \rightarrow$ source current]



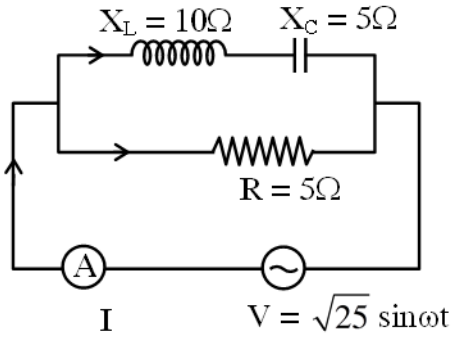
(A) 

(B) 

(C) 

(D) 

20. Find ammeter reading.



(A) 2A

(B) $\sqrt{2}$A

(C) $\frac{1}{\sqrt{2}}$A

(D) 1A

SECTION-II : (Maximum Marks: 20)

This section contains 05 questions.

The answer to each question is a **Numerical Value.**

For each question, enter the correct integer value (In case of non-integer value, the answer should be rounded off to the nearest Integer).

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If correct answer is entered.

Zero Marks : 0 If the question is unanswered.

Negative Marks : –1 If wrong answer is entered.

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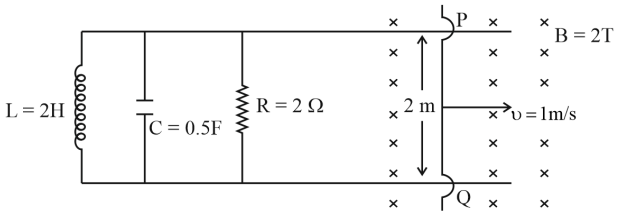
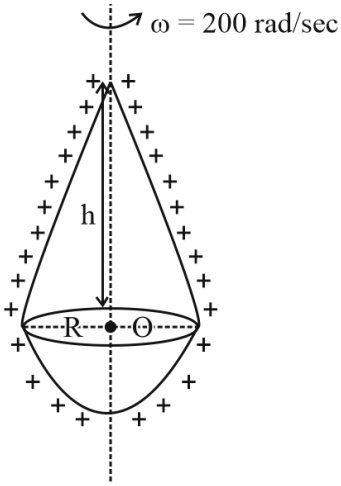
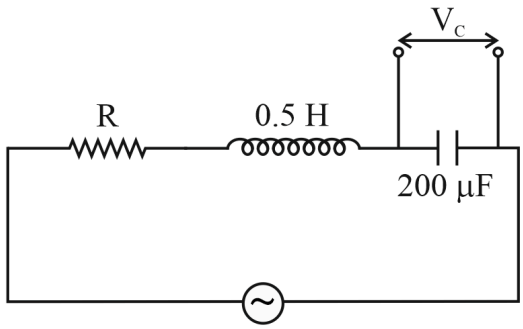
1. An inductor, capacitor and resistance are connected in parallel with a conducting wire. At t = 0 capacitor is uncharged and there is no current in inductor. Conducting wire PQ is moving with constant velocity 1 m/s. Find work done (in J) by the external force on the wire PQ in first 3 seconds.



2. As shown in figure, a hollow cone and a hemispherical shell are joined together. Mass of each is 2 kg and combined body is rotating about its axis with angular speed 200 rad/sec. 3 Coulomb charge is uniformly distributed over the entire surface. Find magnetic dipole moment (in Am^2) of the system if R = 20 cm and h = 40 cm.

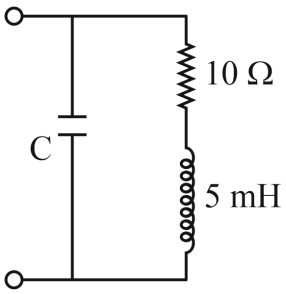


3. In the given circuit, we are interested in measurement of voltage across capacitor. Assuming very low damping and steady state, the value of R for which voltage amplitude across capacitor is maximum, is given by $40\sqrt{x}$ in ohm. Find x.

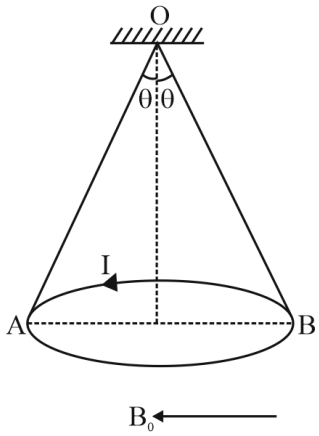


V = 200 sin60t, volt

4. An industrial load is modeled as a series combination of an inductor and resistance as shown in the figure. Calculate the value of capacitance C (in μF) across the series combination so that the net impedance is resistive at an angular frequency ω = 2000 rad/s.



5. A uniform ring of mass M and radius R carries a current I (see figure). The ring is suspended using two identical strings OA and OB. There exists a uniform horizontal magnetic field B_0 parallel to the diameter AB of the ring. Calculate the ratio of the tension $\frac{T_{AO}}{T_{BO}}$ in the two strings. [Given: θ = 60°, M = 1 kg, g = 10 m/s^2, r = $\frac{5}{\pi}$ m, B_0 = 1 T, I = 1 A]



PART-2 : CHEMISTRY

SECTION-I : (Maximum Marks: 80)

This section contains **20 questions**. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) **Only one option is correct**. For each question, marks will be awarded as follows:

Full Marks : +4 If correct answer is selected.

Zero Marks : 0 If none of the option is selected.

Negative Marks : –1 If wrong option is selected.

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1. For He^+ ion in 1^{st} excited state, select the correct statement(s) :

(P) P.E. in 1^{st} excited state is - 13.6 eV

(Q) K.E. in 1^{st} excited state is 13.6 eV

(R) Total energy in 1^{st} excited state is - 13.6 eV

(A) P, Q, R (B) P, Q (C) Q, R (D) P

2. $L_{n,z}$ = orbit angular momentum for n^{th} orbit of hydrogen and hydrogen like species then calculate ratio of $\frac{L_{2,2}}{L_{2,3}}$

(A) 1 : 1 (B) 2 : 1 (C) 1 : 2 (D) 2 : 3

3. **Assertion:** The boiling points of aldehydes and ketones are higher than hydrocarbons and ethers of comparable molecular masses.

Reason: Absence of inter molecular hydrogen bonding in aldehydes and ketones.

(A) Both assertion and reason are true and reason is a correct explanation of the assertion.

(B) Both assertion and reason are true but the reason is not the correct explanation of the assertion.

(C) Assertion is true but reason is false

(D) Assertion is false but reason is true

4. Total number of nodal surfaces in $5p_x$ orbital is

(A) 2 (B) 3

(C) 1 (D) 4

5. Proposed mechanism for decomposition of O_3 is given as :

Net reaction : $2O_3 \rightarrow 3O_2$

$O_3 \underset{K_{-1}}{\overset{K_1}{\rightleftharpoons}} O_2 + O$ (fast equilibrium)

$O + O_3 \xrightarrow{K_2} 2O_2$ (slow)

Some informations are :

(P) Overall order of the reaction is 3/2

(Q) Overall order of the reaction is 1

(R) Increasing O_2 concentration decreases overall rate of reaction.

(S) Decreasing O_3 concentration increases overall rate of reaction.

(A) P and R (B) Q and R

(C) Q and S (D) P and S

6.

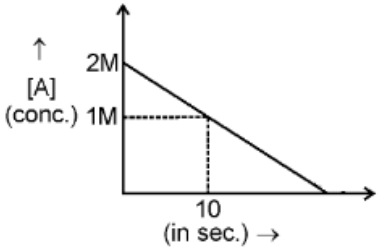
Column-I		Column-II	
(A)	4	(p)	Number of nodes in 3s
(B)	5	(q)	Number of sub-shells in third energy level
(C)	3	(r)	Number of unpaired electron in Fe^{2+}
(D)	2	(s)	Number of electrons with n = 3 in an atom of phosphorus.

(A) A-r, B-s, C-q, D-p (B) A-s, B-q, C-p, D-r

(C) A-p, B-q, C-s, D-r (D) A-r, B-s, C-p, D-q

7. For a zero order reaction, $A \xrightarrow{k} B$

Variation of concentration of A with time is given as:



Then calculate time to reduce concentration of A from 2 M to 0.5 M

(A) 10 sec (B) 20 sec

(C) 15 sec (D) 25 sec

8. In the following reaction : xA → yB

$$\log_{10}\left[-\frac{d[A]}{dt}\right] = \log_{10}\left[\frac{d[B]}{dt}\right] + 0.3$$

where -ve sign indicates rate of disappearance of the reactant. Thus, x : y is (use : $\log_{10} 2 = 0.3$)

(A) 1 : 2 (B) 2 : 1 (C) 3 : 1 (D) 3 : 10

9. Maximum number of electrons in a shell having $m_s = +\frac{1}{2}$ will be:

(m_s = Spin quantum number)

(A) $2\ell + 1$ (B) $2n^2$

(C) n^2 (D) $2(2\ell + 1)$

10. Select the correct statement(s) :

(P) Catalyst does not change the ΔH of the reaction

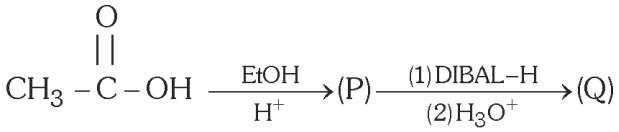
(Q) On increasing concentration of reactant, rate of reaction always increases

(R) On increasing temperature, rate of reaction increases mainly due to increase in collision frequency between reactant molecules.

(A) Only P (B) Only Q

(C) Only R (D) None of these

11. The final major product "Q" obtained in the following reaction is



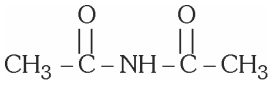
(A) CH_3CH_2OH

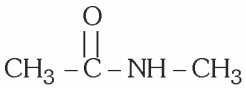
(B) CH_3CHO

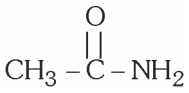
(C) CH_3COOEt

(D) Both (A) and (B)

12. Which compound can show Hoffmann degradation?

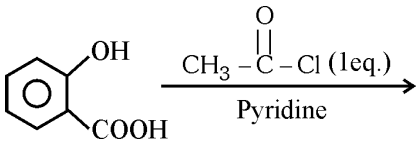
(A) 

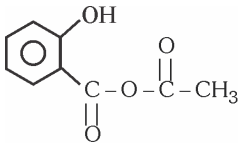
(B) 

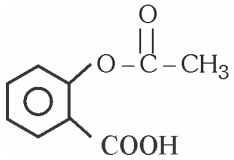
(C) 

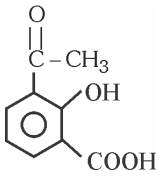
(D) Both (A) and (C)

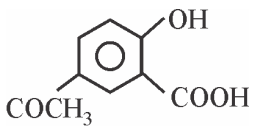
13. The major organic product obtained in the following reaction is:



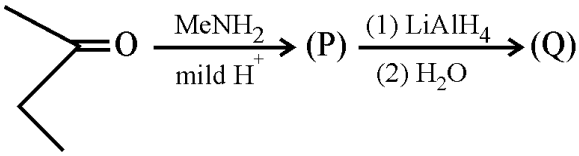
(A) 

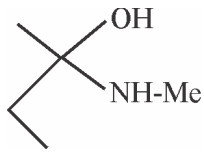
(B) 

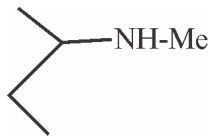
(C) 

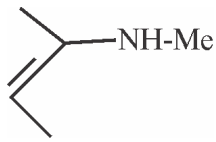
(D) 

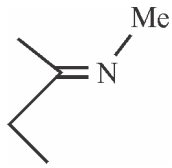
14. Consider the following sequence of reactions, the final product (Q) is:



(A) 

(B) 

(C) 

(D) 

15. **Statement-I:** When  is reacted with  , the marked nitrogen will react with acetone to form major product.

Statement-II: In the above reaction, pH range is maintained between 4.5 to 6.0

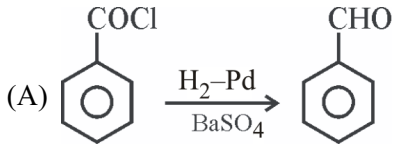
(A) Both statement-I & statement-II are true

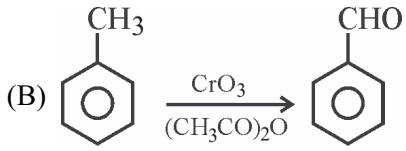
(B) Statement-I is true & statement-II is false

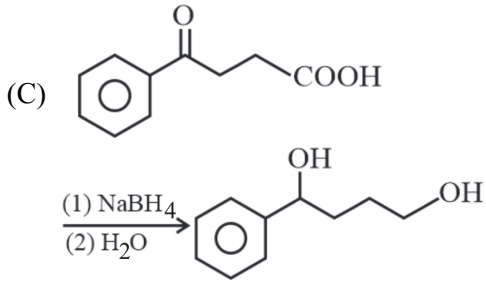
(C) Statement-I is false but statement-II is true.

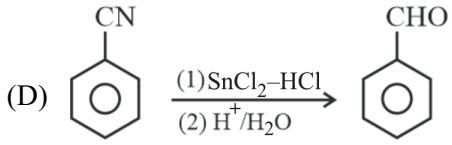
(D) Both statements-I and Statement-II are false.

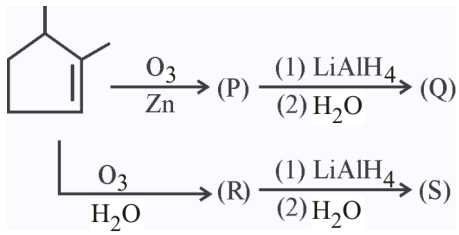
16. Reaction **incorrectly** matched with product is

(A) 

(B) 

(C) 

(D) 

17. 

Select the **incorrect** statement for above reaction sequence.

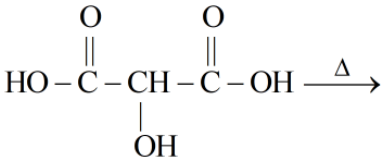
(A) (S) $\xrightarrow{PCC}$ (P)

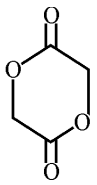
(B) (Q) $\xrightarrow{PCC}$ (R)

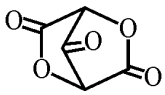
(C) (P) and (R) can be differentiated by $NaHCO_3$ test

(D) (Q) and (S) are same compounds

18. The product obtained in the following reaction is:



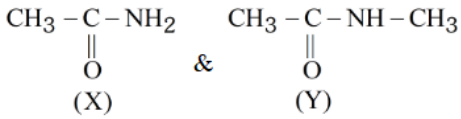
(A) 

(B) 

(C) CH_3OH

(D) CH_3COOH

19. A container containing two acid amides



Following sequences of reaction are made on amides:

$$\text{Amide(X)} \xrightarrow[(2)H_2O]{(1)LiAlH_4} (P)$$

$$\text{Amide(Y)} \xrightarrow[(2)H_2O]{(1)LiAlH_4} (Q)$$

The final product obtained in the following reaction is

$$(P) \xrightarrow[\substack{(2)\ LiAlH_4 \\ (3)\ H_2O}]{(1)\ CHCl_3, KOH}$$

(A) Compound (X)

(B) Compound (Y)

(C) Compound (P)

(D) Compound (Q)

20. The unknown "T" is

$$PhCOOCH_3 \xrightarrow{H_3O^+} (P) + (Q)$$

$$(P) \xrightarrow{Ca(OH)_2} (R) \xrightarrow[(CH_3COO)_2Ca]{\text{Dry distillation}} (S)$$

$$(S) \xrightarrow{m\text{-CPBA}} (T)$$

(A) Ph COOH

(B) CH_3COOH

(C) CH_3COOPh

(D) $PhCOCH_3$

SECTION-II : (Maximum Marks: 20)

This section contains 05 questions.

The answer to each question is a **Numerical Value.**

For each question, enter the correct integer value (In case of non-integer value, the answer should be rounded off to the nearest Integer).

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If correct answer is entered.

Zero Marks : 0 If the question is unanswered.

Negative Marks : –1 If wrong answer is entered.

1. Total number of possible structures of amines of molecular formula ($C_4H_{11}N$), which on reaction with benzene sulphonyl chloride to form a precipitate that is insoluble in alkali is

2. Total number of possible different acetals when acetaldehyde is treated with glycerol under mild acidic condition is?

3. The $t_{1/2}$ of a reaction becomes 4 times when initial reactant concentration is halved. The order of reaction is

4. For a 1st order reaction value of $\left(\frac{t_{99.99\%}}{t_{90\%}}\right)$ is :

5. How many orbitals will have energies between those of 8s and 8p sub-shells according to Aufbau principle ?

PART-3 : MATHEMATICS

SECTION-I : (Maximum Marks: 80)

This section contains **20 questions**. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) **Only one option is correct**. For each question, marks will be awarded as follows:

Full Marks : +4 If correct answer is selected.

Zero Marks : 0 If none of the option is selected.

Negative Marks : –1 If wrong option is selected.

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1. Number of words which can be formed using all the letters of word HIP HIP HURRAY in which all H′s lie some where between R′s is

(A) (198)7! (B) (99)7!

(C) (99)8! (D) (198)8!

2. Values of a and b are obtained by throwing an unbiased die for two times. What is the probability that roots of the equation $ax^2 - 2bx + 7 = 0$ are real and distinct ?

(A) $\frac{1}{2}$ (B) $\frac{13}{36}$ (C) $\frac{11}{36}$ (D) $\frac{7}{36}$

3. A fair coin is tossed n times. Let p_n denotes the probability that no two (or more) consecutive heads occur in n tosses.

Assertion A : The probabilities p_2, p_3, p_4 are in arithmetic progression.

Reason R : The probabilities p_1, p_2, p_3, ..., p_n are in decreasing order.

(A) **A** is true, **R** is true and **R** is correct explanation for **A**.

(B) **A** is true, **R** is true and **R** is NOT the correct explanation for **A**.

(C) **A** is true, **R** is false.

(D) **A** is false, **R** is true.

4. $\log_x^3 . \log_{3x}^3 . \log_3^{9x} > 1$, than smallest natural value of x will be :

(A) 2 (B) 3

(C) 4 (D) 1

5. Number of solution of the equation $(\sin x + \cos x)^{1+\cos 8x} = 2$ in $\left(0, \frac{\pi}{2}\right)$ is -

(A) 0 (B) 1

(C) 2 (D) 4

6. If three fair dice are tossed and the product of the three numbers that appear is even, the probability that the sum of the numbers is also even, is

(A) $\frac{1}{2}$ (B) $\frac{3}{5}$

(C) $\frac{4}{7}$ (D) $\frac{5}{7}$

7. Four consecutive natural numbers are chosen from first 50 natural numbers. What is the probability that their sum is divisible by 3 ?

(A) $\frac{15}{{}^{50}C_4}$ (B) $\frac{15}{47}$

(C) $\frac{{}^{16}C_4}{{}^{50}C_4}$ (D) $\frac{{}^{3\times16}C_4}{{}^{50}C_4}$

8. If $\sum_{r=0}^{n} a_r \frac{x^r}{(1+x)^{2r}} = \frac{(1+x^3)^n}{(1+x)^{3n}}$, then value of $\frac{a_5}{a_4}$ will be :

(A) $\frac{-(3n+12)}{5}$ (B) $\frac{(3n-12)}{5}$

(C) $\frac{(12-3n)}{5}$ (D) $\frac{5}{(12-3n)}$

9. For the set of observations : 5, 5, 7, 10, 12, 12, 14, 15; Match entries of List-I with that of List-II ; and mark correct option :

List-I		List-II	
(A)	Sum of digits in [variance] is, ([.] is greatest integer function)	(I)	13
(B)	Twice of sum of mean deviation about median and mean deviation about mean is	(II)	3
(C)	The value of [Standard deviation] is (where [.] is greatest integer function)	(III)	4
(D)	Absolute difference of median and mean is	(IV)	1

(A) (A) – I, (B) – III, (C) – II, (D) – IV

(B) (A) – III, (B) – II, (C) – IV, (D) – I

(C) (A) – IV, (B) – II, (C) – IV, (D) – I

(D) (A) – III, (B) – I, (C) – II, (D) – IV

10. Ratio of coefficient of x^{51} to coefficient of x^{50} in the expansion of $(1 + x + x^2)(1 + x^2)^{50}$

(A) $\frac{51}{26}$ (B) $\frac{1}{2}$

(C) $\frac{2}{1}$ (D) $\frac{26}{51}$

11. $\sum_{r=1}^{50} r^2 \left(\frac{{}^{50}C_r}{{}^{50}C_{r-1}}\right)^2$ is equal to

(A) 1275 (B) 1625625

(C) 42925 (D) 125499

12. ${}^{95}C_{90} + 5 \cdot {}^{95}C_{91} + 10 \cdot {}^{95}C_{92} + 10 \cdot {}^{95}C_{93} + 5 \cdot {}^{95}C_{94} + {}^{95}C_{95}$ equals :

(A) $30 \cdot {}^{99}C_4$ (B) ${}^{101}C_6 - {}^{100}C_5$

(C) $95 \cdot {}^{98}C_3$ (D) $495 \cdot {}^{98}C_3$

13. The equation $(2 + \log_{10} x)^3 + (\log_{10} x - \log_{10} 10)^3 = \left(1 + \log_{10} (x)^2\right)^3$ has

(A) Two irrational and one rational solutions

(B) One irrational and two rational solutions

(C) One irrational and two prime number solutions

(D) All rational solutions

14. In a random experiment, a fair coin is tossed. If Head is obtained, then an unbiased die is thrown 2 times and sum of number is recorded. If Tail is obtained, then 2 Tokens are drawn, from a box that contains tokens numbered as 1, 2, 3,....., 10, with replacement, and sum of the number is recorded. If it is known that sum recorded is prime than the probability that the head was obtained, is :

(A) $\frac{125}{236}$ (B) $\frac{126}{235}$ (C) $\frac{121}{236}$ (D) $\frac{121}{235}$

15. **Statement I :** Number of ways in which number 500 can be written as a product of two even natural numbers are 2 (Order of number does not matter).

Statement II : 500 identical balls can be distributed among five students in ${}^{254}C_4$ ways. If atleast 50 balls are given to each student.

(A) Statement I is true, but statement II is false.

(B) Statement I is false, but statement II is true.

(C) Both I and II are true.

(D) neither statement I, nor statement II is true.

16. Variance of first 11 terms of an Arithmatic Progression, with common difference -5 is :

(A) 150 (B) 350

(C) 250 (D) 450

17. Let $x_1, x_2, x_3, \ldots\ldots x_{10}$ be ten observations of a random variable X.

If $\sum_{i=1}^{10}(x_i - \lambda) = 3$ and $\sum_{i=1}^{10}(x_i - \lambda)^2 = 13$

then variance of these observations is :

(A) 1.35 (B) 1.31 (C) 1.21 (D) 1.25

18. 3 squares of dimension 1×1 are selected at random from CHESS BOARD. The probability that these selected squares lie on diagonal of chess board and exactly 2 squares are connected with one another is $p = \frac{a}{b}$, where a, b are relatively prime, then a + b is :

(A) 6944 (B) 3472

(C) 3477 (D) 6949

19. If number of words formed by rearranging all the letters of the YUVRAJSINGH such that, It must contains the phrase "YUVI" but not the phrase "IRA" is n, then the value of $\frac{n}{5!}$ is :

(A) 550 (B) 330 (C) 165 (D) 530

20. Coefficient of x^{99} in $x^{100} + 2x^{99}(1+x) + 3x^{98}(1+x)^2 + \ldots\ldots\ldots + 101(1+x)^{100}$ will be

(A) ${}^{101}C_{99} - {}^{101}C_{98}$

(B) $100 \times {}^{101}C_{99} - {}^{101}C_{98}$

(C) $101\ {}^{101}C_{99} - {}^{101}C_{98}$

(D) $101\ {}^{101}C_{98} - {}^{101}C_{99}$

SECTION-II : (Maximum Marks: 20)

This section contains 05 questions.

The answer to each question is a **Numerical Value.**

For each question, enter the correct integer value (In case of non-integer value, the answer should be rounded off to the nearest Integer).

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If correct answer is entered.

Zero Marks : 0 If the question is unanswered.

Negative Marks : –1 If wrong answer is entered.

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1. How many 6 digit number can be formed using digit 1,2, 3, 4 so that no 2 consecutive digits are same in the number and each digit (1, 2, 3, 4) should used at least once in the number.

2. How many natural numbers can be formed which lie in the interval (700, 2678) using digits 2, 6, 7, 8 ?

3. Let $k_1 = 6^{2\log_6 5} + \left(2^{\log_2 3} \times 3^{2\log_3 2}\right)$ &

$k_2 = \left(\sqrt{3}\right)^{12\log_3 2} + 49^{\log_7 3}$ then $k_1 + k_2$ is equal to

4. For k = 1, 2, 3 the box B_k contains k red balls and (k + 1) white balls. Let $P(B_1) = \frac{1}{2}, P(B_2) = \frac{1}{3}$ & $P(B_3) = \frac{1}{6}$, where $P(B_k)$ represents probability of selection of box B_k. A box is selected randomly and a ball is drawn, if it is known that drawn ball is red. Then the probability that it has come from Box B_2 is $\frac{p}{q}$, where p & q are coprime then p + q is equal to

5. Number of 6 digit number (Formed without using zero & without repetition) such that first 3 places of the number are in increasing order and last 3 places are in decreasing order will be

Space for Rough Work