

JEE EXPERT

STAYHOME#STAYSAFE CORONA KO STOP KARNA HAI AT LOCKDOWN, UNLOCK YOUR POTENTIAL PRACTICE TEST – 06

Time : 3 hours

Maximum Marks : 240

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
- You are not allowed to leave the examination hall before end of the test.

Instructions

- Note:**
1. The question paper contains 3 sections (Sec-I, Chemistry, Sec-II, Physics & Sec-III, Mathematics).
 2. Each section is divided into two parts, **Part-A** and **Part-C**.
 3. **Part – A** contains 16 questions which are further divided as follows:
 - ❖ **Q. 1 – 7** are multiple choice questions. Each question has four choices (A), (B), (C) and (D), out of which **only one is correct**.
 - ❖ **Q. 8 – 11** are multiple correct answer type questions. Each question has four choices (A), (B), (C) and (D), out of which **one or more answer(s) is/are correct**.
 - ❖ **Q. 12 – 16** contains **two** sets of linked comprehension type questions. Each question has four choices (A), (B), (C) and (D) out of which only one is correct.
 4. **Part – C** contains 7 questions (**Q. 1 – 7**). The answer to each of the questions is a single – digit integer, ranging from 0 to 9. The appropriate bubbles against the respective question numbers in the ORS have to be darkened.
 5. Use OMR ICR400410SS

Marking Scheme

1. For each question in the group **Q. 1 – 7** of **Part – A** you will be awarded **3 marks** if you have darkened only the bubble corresponding to the correct answer and **zero marks** if no bubble is darkened. In all other cases, **minus one (–1) mark** will be awarded.
2. For each question in the group **Q. 8 – 11** of **Part – A** you will be awarded **4 marks** if you have darkened all the bubble(s) corresponding to the correct answer and **zero marks** if no bubble is darkened. No negative marks will be awarded in this section.
3. For each question in the group **Q. 12 – 16** of **Part – A** you will be awarded **3 marks** if you have darkened only the bubble corresponding to the correct answer and **zero mark** if no bubble is darkened. In all other cases, **minus one (–1) mark** will be awarded.
4. For each question in **Part – C**, you will be awarded **4 marks** if you have darkened the bubble corresponding to the correct answer and **zero mark** if no bubble is darkened. No negative marks will be awarded in this section.

Name of the Candidate :

Enrolment Number :

Useful Data Chemistry:

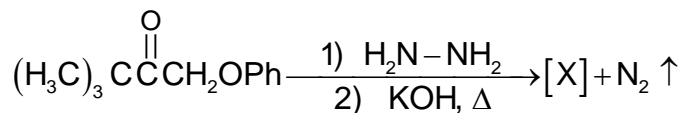
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		=	0.0821 Lit atm K ⁻¹ mol ⁻¹
		=	1.987 ≈ 2 Cal K ⁻¹ mol ⁻¹
Avogadro's Number	N _a	=	6.023 × 10 ²³
Planck's Constant	h	=	6.626 × 10 ⁻³⁴ Js
		=	6.25 × 10 ⁻²⁷ erg.s
1 Faraday		=	96500 Coulomb
1 calorie		=	4.2 Joule
1 amu		=	1.66 × 10 ⁻²⁷ kg
1 eV		=	1.6 × 10 ⁻¹⁹ J
Atomic No :	H=1, D=1, Li=3, Na=11, K=19, Rb=37, Cs=55, F=9, Ca=20, He=2, O=8, Au=79.		
Atomic Masses:	He=4, Mg=24, C=12, O=16, N=14, P=31, Br=80, Cu=63.5, Fe=56, Mn=55, Pb=207, Au=197, Ag=108, F=19, H=2, Cl=35.5, Sn=118.6		

Useful Data Physics:

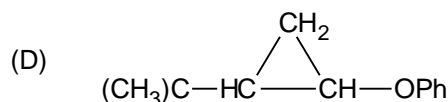
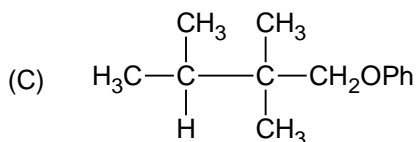
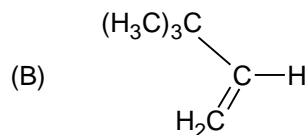
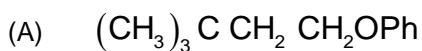
Acceleration due to gravity $g = 10 \text{ m/s}^2$

Section – I (Chemistry)**PART – A****Single Correct Choice Type**

1



The product [X] is

2. Give mechanistic symbols (S_N1 , S_N2 , E1 and E2) that are most consistent with the following statements.

(i) These reaction mechanisms represent concerted processes.

(ii) Methyl halide reacts with sodium ethoxide in ethanol only by this mechanism.

(iii) These reaction mechanism involve carbocation intermediates

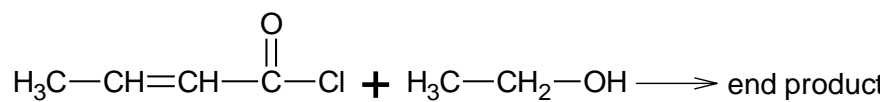
(iv) The principal substitution product obtained by solvolysis of tert.butylbromide in ethanol arises from this mechanism

(v) These reaction mechanism is most likely involved when the products have different carbon skeleton from starting material.

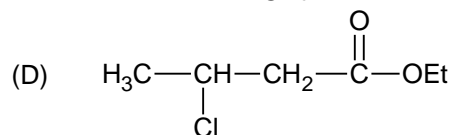
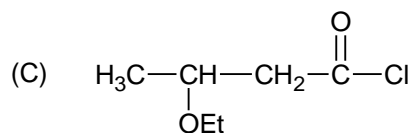
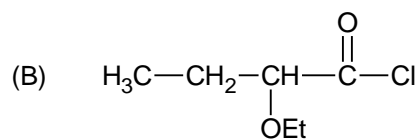
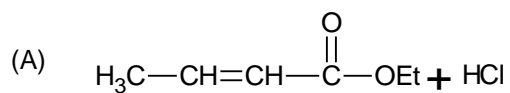
	i	ii	iii	iv	v
(A)	S_{N2}, E_2	S_{N2}	S_{N1}, E_2	S_{N1}	S_{N1}, E_1
(B)	S_{N2}, E_2	S_{N2}	S_{N1}, E_1	S_{N2}	S_{N1}, E_1
(C)	S_{N1}, E_1	S_{N2}	S_{N1}, E_1	S_{N2}	E_1, E_2
(D)	S_{N2}, E_2	S_{N2}	S_{N1}, E_1	S_{N1}	S_{N1}, E_1

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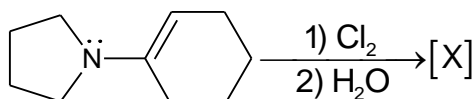
3.



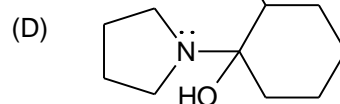
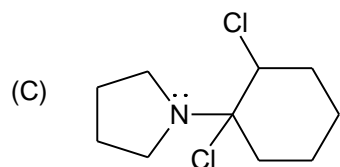
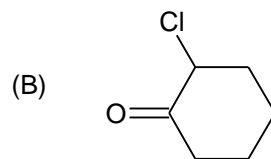
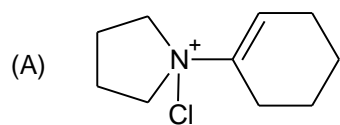
The final end product is



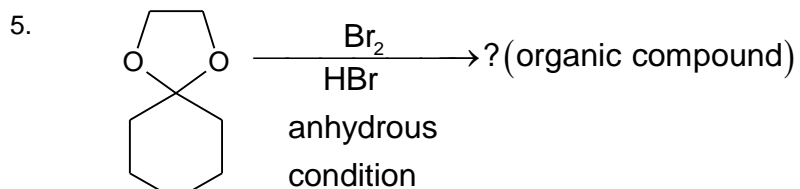
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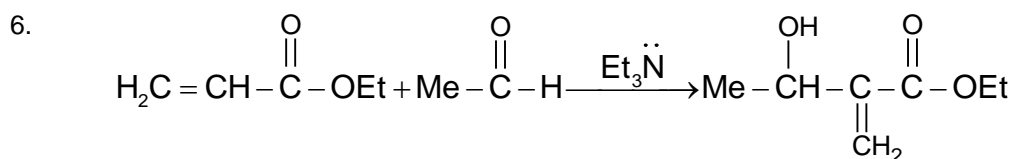
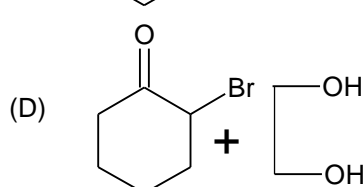
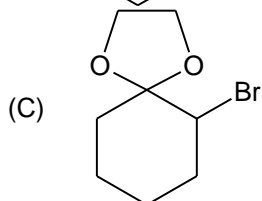
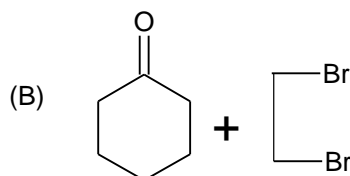
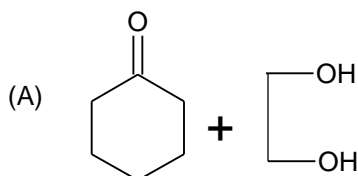
The major compound [X] is



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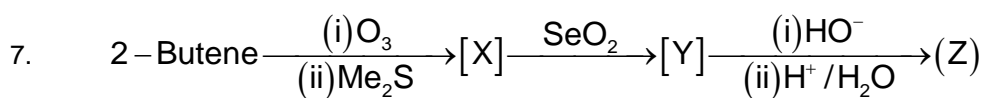
The major organic compound(s) is/are



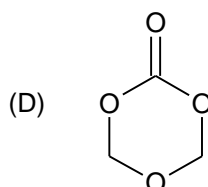
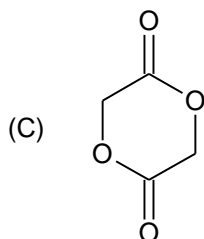
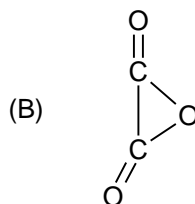
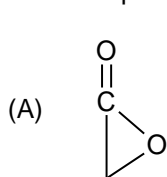
In the above reaction $\text{Et}_3\ddot{\text{N}}$ acts as catalyst which of the following statements is correct for its catalytic action?

- (A) It will attack on carbonyl carbon of aldehyde
- (B) It removes the acidic α -hydrogen of unsaturated ester to generate carbanion nucleophile.
- (C) It will attack on carbonyl carbon of ester.
- (D) It undergoes conjugate addition on unsaturated ester

space for rough work

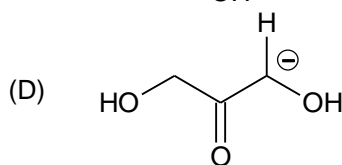
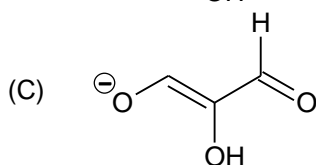
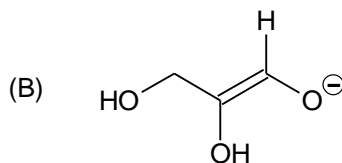
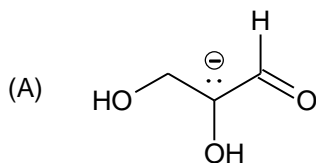
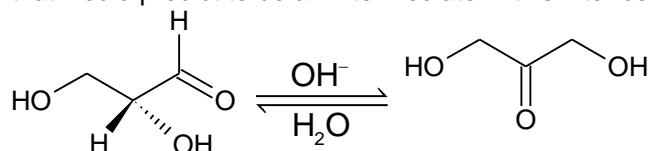


The end product [Z] is



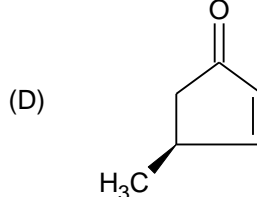
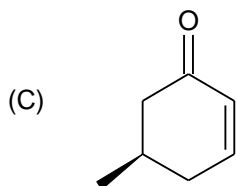
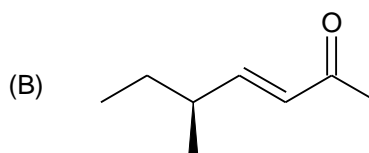
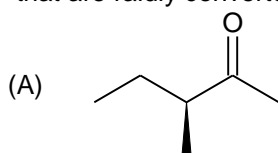
Multiple Correct Choice Type

8. Which of the following is/are correct explanation for why Ketone have an unfavorable equilibrium in an aldol reaction with sodium hydroxide base?
- (A) Ketones are less electrophilic due to a carbonyl carbon that is more stabilized by two electron releasing alkyl groups.
- (B) The Ketone group is stabilized by allylic interactions with the adjacent Pi system.
- (C) There is less Ketone enolate is formed because the alpha protons are less acidic
- (D) Steric hindrance at the carbonyl carbon of a ketone due to two alkyl groups, makes enolate addition more difficult
9. Glyceraldehyde and dihydroxy acetone interconvert in the presence of base. Choose the structures that would predict to be an intermediate in this inter conversion.



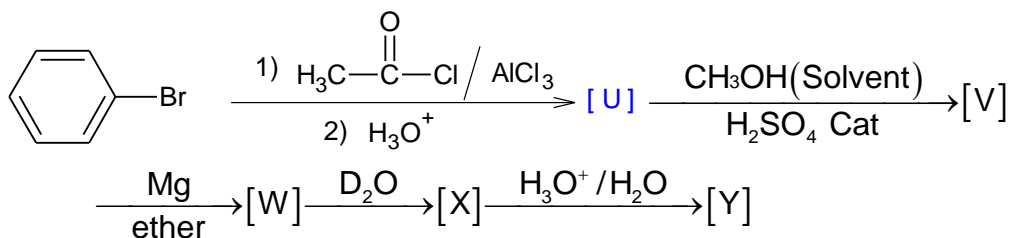
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10. Each of the following compound is chiral. If a sample of pure enantiomer is treated with base, some of the compounds are rapidly converted into racemic mixture and some do not. Identify the compounds that are rapidly converted into racemic mixture.

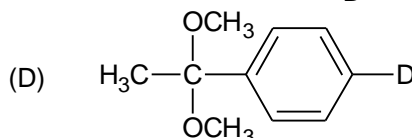
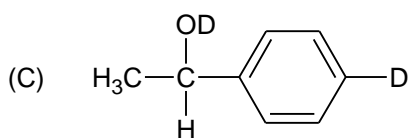
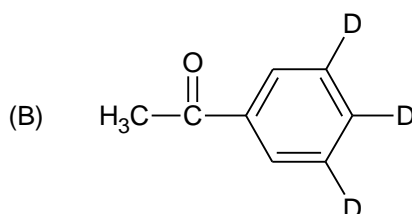
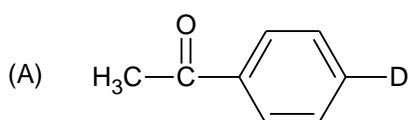


11. Which of the following is incorrect statement for Claisen ester condensation?
- (A) It can be carried out successfully by catalytic amount of strong base $\text{EtO}^- / \text{EtOH}$.
- (B) It can be carried out successfully by 1 equivalent of strong base $\text{EtO}^- / \text{EtOH}$.
- (C) It can be carried out by using strong base $\text{HO}^- / \text{H}_2\text{O}$
- (D) $(\text{CH}_3)_2\text{CH}-\text{C}(=\text{O})\text{OEt}$ undergoes successful Claisen ester condensation

Comprehension Type
Paragraph for question Nos. 12 to 13

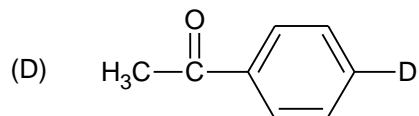
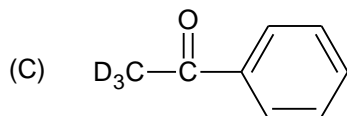
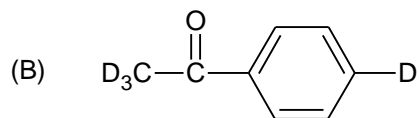
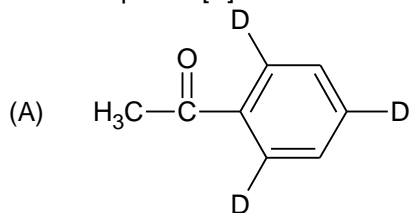


12. The compound [X] is



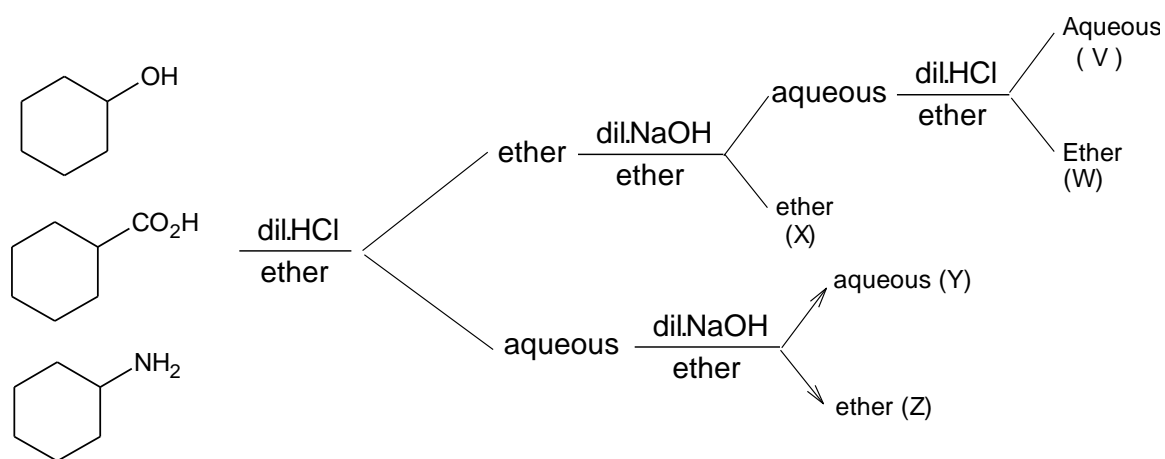
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13. The compound [Y] is



Paragraph for Question Nos. 14 to 16

Suppose you had a mixture of three compounds shown on the left below and carried out the indicated separation schema



14. Which flask contains cyclohexanol?

- (A) V
(C) X

- (B) W
(D) Y

15. Which flask contains cyclohexyl carboxylic acid

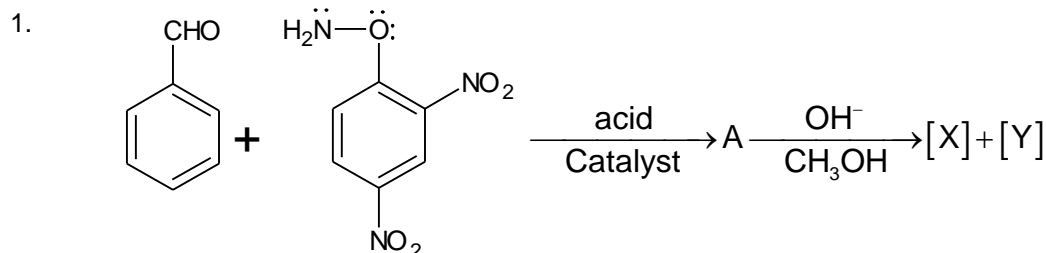
- (A) V
(C) X

- (B) W
(D) Y

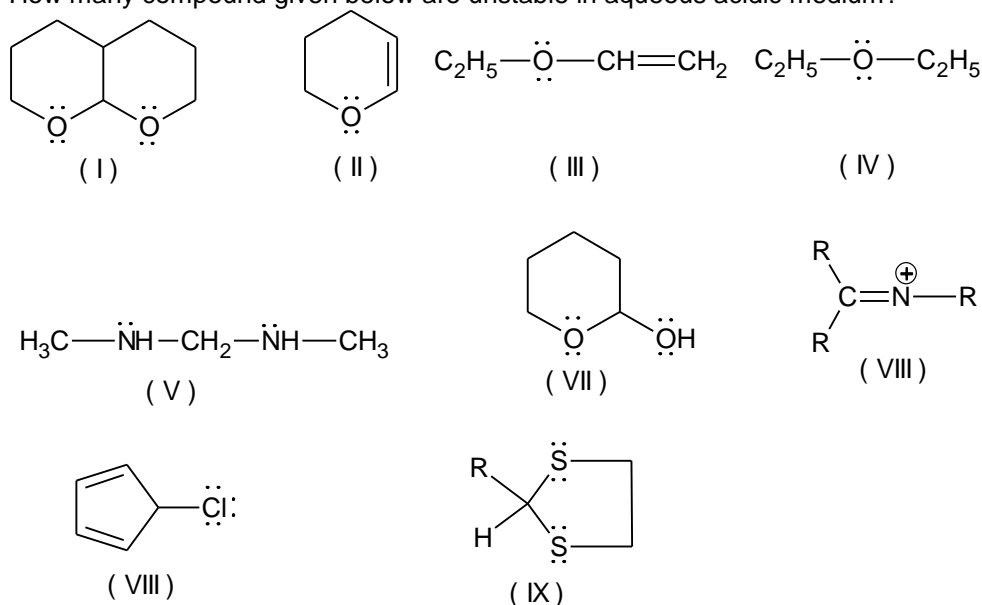
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16. Which flask contain cyclohexyl amine?
 (A) W (B) X
 (C) Y (D) Z

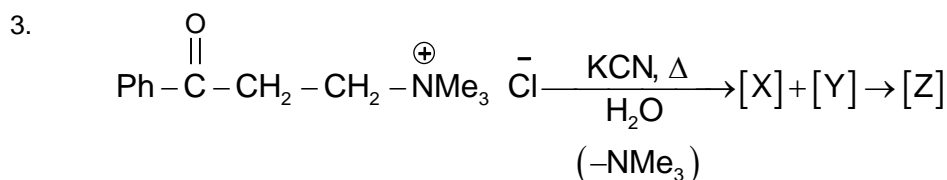
PART – C
Numerical Based



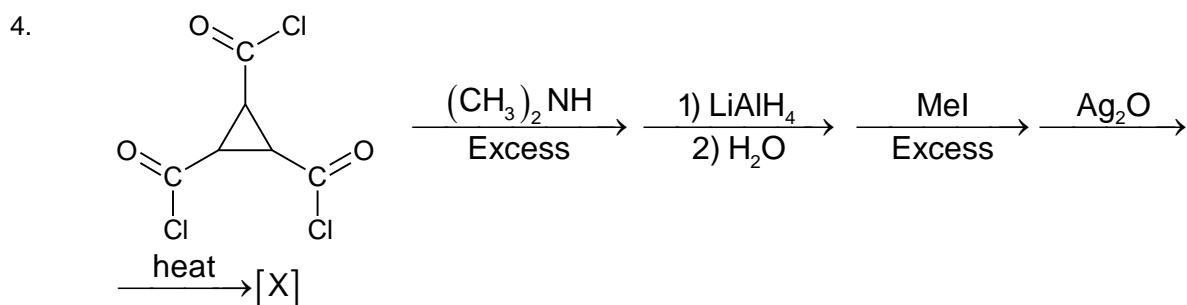
2. How many compound given below are unstable in aqueous acidic medium?



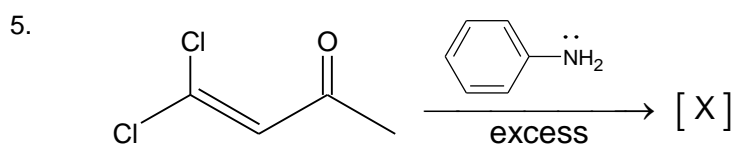
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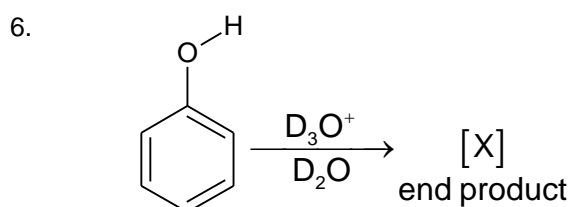
How many π bonds are present in the end product Z?



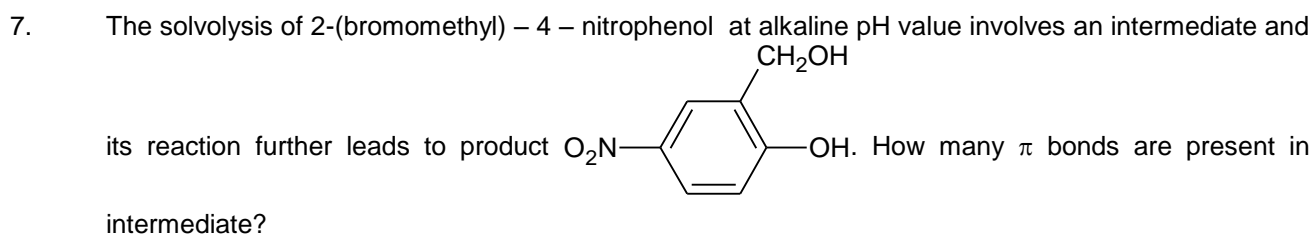
How many π bonds are in the end product [X]?



How many π bonds are in the stable compound [X]?



What are the number in the end deuterium atoms product [X]?



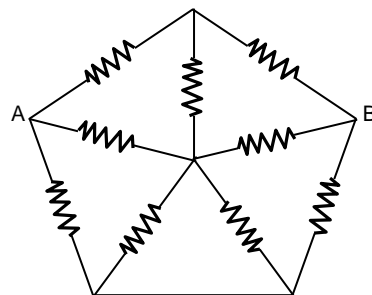
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Section – II (Physics)**PART – A****Single Correct Choice Type**

1. if resistance of each resistor is R , then effective resistance between points A and B of the shown network is

(A) $\frac{8R}{11}$
(C) $\frac{6R}{5}$

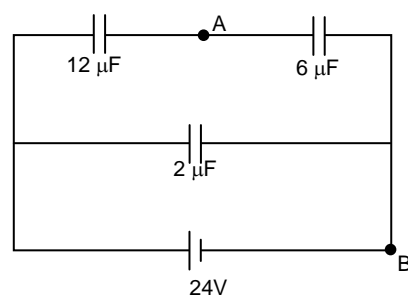
(B) $\frac{6R}{11}$
(D) $\frac{2R}{3}$



2. In figure, if the potential at point B is taken as zero, then the potential at point A will be

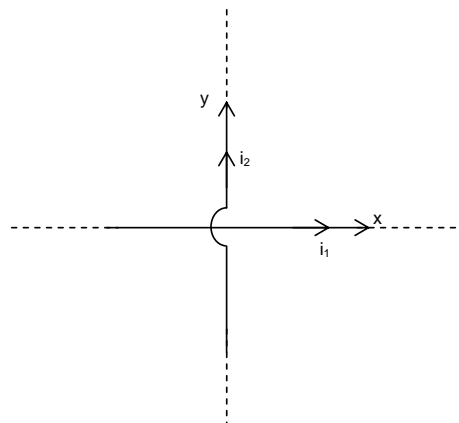
(A) 8V
(C) 24V

(B) 16V
(D) 21V



3. Two infinite wires carrying current i_1 and i_2 are lying along x and y axes, as shown in the x – y plane. Then

- (A) Locus of points where magnetic field B is zero is a circle
(B) Locus of points where magnetic field B is zero is a straight line
(C) Magnetic field B decays hyperbolically along any line parallel x axis
(D) Magnetic field B decays hyperbolically along any line parallel to y axis

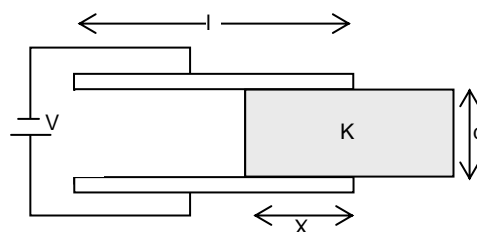


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4. Two positive and equal charges are fixed at certain distance. A third small charge is placed in between the two charges and it experiences zero net force due to the other two
 (A) The equilibrium is stable if small charge is positive
 (B) The equilibrium is stable if small charge is negative
 (C) The equilibrium is stable
 (D) The equilibrium is unstable

5. Figure shows a parallel plate capacitor with plates of width b and length l . The separation between the plates is d . The plates are rigidly clamped and connected to a battery of emf V . A dielectric slab of thickness d and dielectric constant K is slowly inserted between the plates. What force should be applied on the slab to ensure that it goes slowly into the capacitor :

- (A) $\frac{\epsilon_0 b V^2}{2d} l + x K + 1$
 (B) $\frac{\epsilon_0 b V^2}{2d} l + x K - 1$
 (C) $\frac{\epsilon_0 b V^2}{2d} K - 1$
 (D) $\frac{\epsilon_0 b V^2}{d} l + x K - 1$

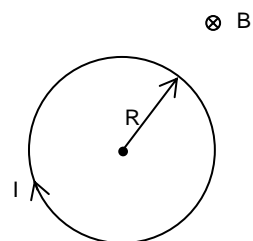


6. In order to convert a milliammeter of range 1.0 mA and resistance 1.0 ohm into a voltmeter of range 10 V , a resistance of how many ohms should be connected with it and in what manner?
 (A) 999Ω in series
 (B) 999Ω in parallel
 (C) $9,999 \Omega$ in series
 (D) $9,999 \Omega$ in parallel

7. A conducting loop is placed in a magnetic field (uniform) as shown in figure

For this situation, markout the correct statement

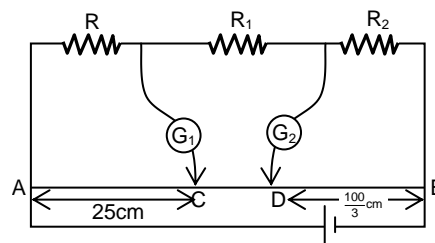
- (A) The force of compression experienced by loop is IRB
 (B) The force of compression experienced by loop is $2IRB$
 (C) The force of expansion experienced by loop is $2IRB$
 (D) The force of expansion experienced by loop is IRB



space for rough work

Multiple Correct Choice Type

8. The diagram shows a modified meter bridge, which is used for measuring two unknown resistances R_1 and R_2 at the same time. When only the first galvanometer is used, balance point is found at point C. Now the first galvanometer is removed and the second galvanometer is used, which gives balance point D. Using the details given in the diagram, find out the value of R_1 and R_2



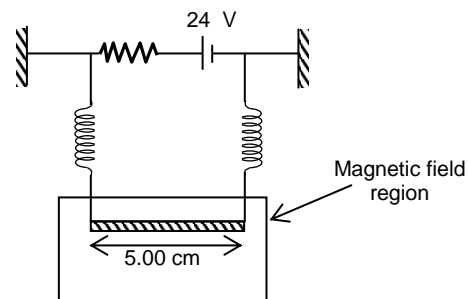
- (A) $R_1 = 5 R / 3$ (B) $R_2 = 4 R / 3$
 (C) $R_1 = 4 R / 3$ (D) $R_2 = 5 R / 3$
9. 10C of charge is given to a conducting spherical shell and a $-3C$ point charge is placed inside the shell. For this arrangement mark out the correct statement(s).
 (A) the charge on the inner surface of the shell will be $+3C$ and it can be distributed uniformly or non uniformly
 (B) The charge on the inner surface of the shell will be $+3C$ and its distribution would be uniform
 (C) The net charge on outer surface of the shell will be $+7 C$ and its distribution can be uniform or non uniform
 (D) the net charge on outer surface of the shell will be $+7C$ and its distribution would be uniform
10. A parallel plate capacitor of plate area A and plate separation d is charged to a potential difference V and then the battery is disconnected. A slab of dielectric constant K is then inserted between the plates of the capacitor so as to fill the space between the plates. If Q , E and W denote the magnitude of charge, the electric field between the plates (after the slab is inserted) and magnitude of the work done on the system in question during the process of inserting the slab, then :
- (A) $Q = \frac{\epsilon_0 A V}{d}$ (B) $Q = \frac{\epsilon_0 K A V}{d}$
 (C) $E = \frac{V}{K d}$ (D) $W = \frac{\epsilon_0 A V^2}{2d} \left(1 - \frac{1}{K} \right)$

space for rough work

11. A proton is fired from origin with velocity $\vec{v} = v_0\hat{j} + v_0\hat{k}$ in a uniform magnetic field $\vec{B} = B_0\hat{j}$. In the subsequent motion of the proton
- (A) its z coordinate can never be negative
 - (B) its x coordinate can never be positive
 - (C) its x and z coordinates cannot be zero at the same time
 - (D) its y coordinate will be proportional to its time of flight.

Comprehension Type
Paragraph for question Nos. 12 to 13

The circuit in figure consists of wires at the top and bottom and identical metal springs as the left and right sides. The wire at the bottom has a mass of 10.0 g and is 5.00 cm long. The wire is hanging as shown in the figure. The springs stretch by 0.500 cm under the weight of the wire and the circuit has a total resistance of $12.0\ \Omega$. When a horizontal magnetic field is turned on, the springs stretch by an additional 0.300 cm. (Neglect any magnetic attraction between different loops of the springs)

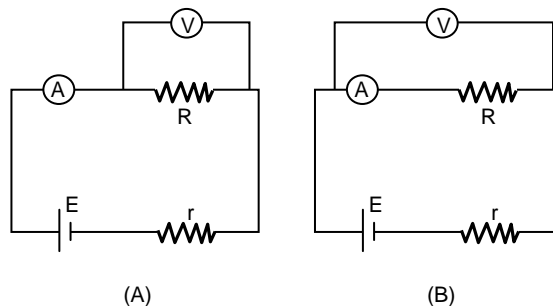


12. From the above statements we can conclude that
- (A) the magnetic field is directed into the plane of page
 - (B) the magnetic field is directed outward of the plane of the page
 - (C) the magnetic field is toward left in the plane of page
 - (D) the magnetic field is toward right in the plane of page
13. The magnitude of magnetic field, according to above question, is
- (A) 1.2T
 - (B) 6T
 - (C) 0.6T
 - (D) 12T

space for rough work

Paragraph for Question Nos. 14 to 16

Resistance value of an unknown resistor is calculated using the formula $R = V/I$, where V and I be the reading of the voltmeter and the ammeter, respectively. Consider the circuits below. The internal resistance of the voltmeter and the ammeter (R_V and R_G respectively) are finite and non zero



Let R_A and R_B the calculated values of resistance R in the two cases A and B respectively

14. The relation between R_A and the actual value of R is

(A) $R > R_A$
(B) $R < R_A$

(C) $R = R_A$
(D) dependent upon E and r
15. The relation between R_B and the actual value of R is

(A) $R > R_B$
(B) $R < R_B$

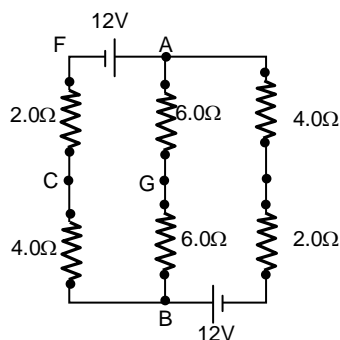
(C) $R = R_B$
(D) dependent upon E and r
16. If the resistance of voltmeter $R_V = 1 \text{ k}\Omega$ and that of ammeter $R_G = 1 \Omega$, then the magnitude of the percentage error in the measurement of R (the actual value of R is 10Ω) is

(A) zero in both cases
(B) non zero but equal in both cases

(C) more in circuit A
(D) more in circuit B

PART – C
Numerical Based

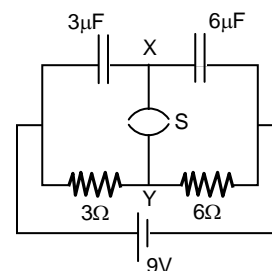
1. In the network shown in the figure, the potential difference (in Volt) across points A and B is



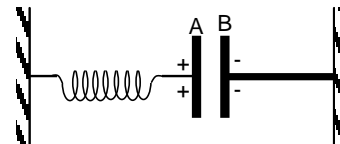
space for rough work

2. Two circular coils of radii 5cm and 10 cm carry equal current of 2A in opposite sense . The coils have 50 and 100 turns respectively and are placed in such a way that they lie in same plane and their centres coincide. Magnitude of magnetic field(in Tesla) at the common centre of coils is

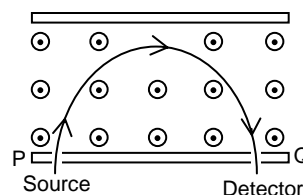
3. A circuit is connected as shown in the figure with the switch S open. When the switch is closed, if total amount of charge that flows from Y to X is Q(in μC), then $\frac{Q}{3} =$



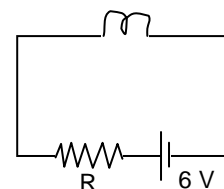
4. Plate A of a parallel plate air filled capacitor is connected to a spring having force constant k and plate B is fixed. They rest on a frictionless table top as shown in the figure. if a charge +q is placed on plate A and a charge -q on plate B, by how much does the spring expand in equilibrium ($q^2 = 6kA\epsilon_0$)



5. A uniform magnetic field with a slit system as shown in the figure is to be used as a momentum filter for high energy charged particles (enter and exit perpendicular to PQ) . With a field of B tesla it is found that the filter transmits α particle each of energy 2.2 MeV. The magnetic field is increased to 2.13B tesla and deuteron ions are passed into the filter. What is the approximate energy (In MeV) of each deuteron ions transmitted by the filter?



6. A bulb is rated 1.5 V and 0.5 A. A 12 V battery is connected to the bulb as shown. If the bulb is to operate at its normal brightness, value of R (in Ω) is



7. A capacitor of capacity $C_1 = 1.0 \mu\text{F}$ withstands the maximum voltage $V_1 = 6\text{kV}$ while another capacitor of capacitance $C_2 = 2 \mu\text{F}$ withstands the maximum voltage $V_2 = 4 \text{kV}$. What maximum voltage (In kV) will the system of these two capacitors withstand if they are connected in series?

space for rough work

Section – III (Mathematics)**PART – A****Single Correct Choice Type**

1. If $\left[\cos^{-1} x \right] + \left[\cot^{-1} x \right] = 0$, where $[.]$ denotes the greatest integer function, then the complete set of values of x is
(A) $(\cos 1, 1]$ (B) $(\cos 1, \cot 1)$
(C) $(\cot 1, 1]$ (D) $[0, \cot 1)$
2. If $2f(x^2) + 3f\left(\frac{1}{x^2}\right) = x^2 - 1 \forall x \in \mathbb{R} - \{0\}$ then $f(x^4)$ is
(A) $\frac{(1-x^4)(2x^4+3)}{5x^4}$ (B) $\frac{(1+x^4)(2x^4-3)}{5x^4}$
(C) $\frac{(1-x^4)(2x^4-3)}{5x^4}$ (D) $(1-x^4)(2x^4-3)$
3. Let a function $f(x)$ be defined by $f(x) = \frac{x - |x-1|}{x}$, then which of the following is **not true**
(A) discontinuous at $x=0$ (B) discontinuous at $x=1$
(C) not differentiable at $x=0$ (D) not differentiable at $x=1$
4. $f(x) = [x^2] - \{x\}^2$, where $[.]$ and $\{.\}$ denote the greatest integer function and fractional part respectively, is
(A) continuous at $x=1, -1$ (B) continuous at $x=-1$ but not at $x=1$
(C) continuous at $x=1$ but not at $x=-1$ (D) discontinuous at $x=1$ and $x=-1$
5. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ be two one-one and onto functions such that they are the mirror images of each other about the line $y=a$. If $h(x) = f(x) + g(x)$, then $h(x)$ is
(A) one-one and onto (B) only one-one and not onto
(C) only onto but not one-one (D) Neither one-one nor onto

space for rough work

6. If $f(u) = \lim_{t \rightarrow \infty} \frac{(1 + \sin \pi u)^t - 1}{(1 + \sin \pi u)^t + 1}$ is not continuous at $u=x$. Then the value of x is
- (A) 1 (B) 1/2
(C) 1/3 (D) 1/5
7. The value of the integral $\int (x^2 + x)(x^{-8} + 2x^{-9})^{1/10} dx$ is
- (A) $\frac{5}{11}(x^2 + 2x)^{11/10} + c$ (B) $\frac{5}{6}(x + 1)^{11/10} + c$
(C) $\frac{6}{7}(x + 1)^{11/10} + c$ (D) none of these

Multiple Correct Choice Type

8. If $f(x) = \lim_{n \rightarrow \infty} \frac{x}{x^{2n} + 1}$, then
- (A) $f(1^+) + f(1^-) = 0$ (B) $f(1^+) + f(1^-) + f(1) = 3/2$
(C) $f(-1^+) + f(-1^-) = -1$ (D) $f(1^+) + f(-1^-) = 0$
9. If $f(x) = [x]$, where $[.]$ denotes the greatest integer function, then which of the following is **not true**?
- (A) $f(x)$ is continuous $\forall x \in \mathbb{R}$
(B) $f(x)$ is continuous from right and discontinuous from left $\forall x \in \mathbb{N} \cup \{0\}$
(C) $f(x)$ is continuous from left and discontinuous from right $\forall x \in \mathbb{I}$
(D) $f(x)$ is continuous at $x=0$
10. Let the parabolas $y = x(c - x)$ and $y = x^2 + ax + b$ touch each other at the point $(1,0)$, then
- (A) $a + b + c = 0$ (B) $a + b = 2$
(C) $b - c = 1$ (D) $a + c = -2$

space for rough work

11. If $f'(x) = g(x)(x-a)^2$ where $g(a) \neq 0$ and g is continuous at $x=a$, then
- (A) f is increasing in the neighborhood of a if $g(a) > 0$
(B) f is increasing in the neighborhood of a if $g(a) < 0$
(C) f is decreasing in the neighborhood of a if $g(a) > 0$
(D) f is decreasing in the neighborhood of a if $g(a) < 0$

Comprehension Type
Paragraph for question Nos. 12 to 13

Let $f: \mathbb{R} \rightarrow \mathbb{R}$ is a function satisfying $f(2-x) = f(2+x)$ and $f(20-x) = f(x), \forall x \in \mathbb{R}$. For this function f , answer the following

12. If $f(0) = 5$, then the minimum possible number of values of x satisfying $f(x) = 5$, for $x \in [0, 170]$, is
- (A) 21 (B) 12
(C) 11 (D) 22
13. If $f(2) \neq f(6)$, then the
- (A) fundamental period of $f(x)$ is 1 (B) fundamental period of $f(x)$ may be 1
(C) period of $f(x)$ cannot be 1 (D) fundamental period of $f(x)$ is 8

Paragraph for Question Nos. 14 to 16

If $y = f(x)$ satisfies the relation $\int_2^x f(t) dt = \frac{x^2}{2} + \int_x^2 t^2 f(t) dt - 2$

14. The range of $y = f(x)$ is
- (A) $[0, \infty)$ (B) \mathbb{R}
(C) $(-\infty, 0]$ (D) $\left[-\frac{1}{2}, \frac{1}{2}\right]$

space for rough work

15. The value of $\int_{-2}^2 f(x) dx$ is
(A) 0 (B) -2
(C) $2\log 2$ (D) none of these
16. The value of x for which $f(x)$ is increasing, is
(A) $(-\infty, 1]$ (B) $[-1, \infty)$
(C) $[-1, 1]$ (D) none of these

PART – C
Numerical Based

1. If a function 'f' such that $x \int_0^x (1-t) \cdot f(t) dt = \int_0^x t f(t) dt$ and $f(1) = 1$, and $f(2) = \frac{1}{k} e^{1/2}$, then k equals to _____
2. Let $f(x) = \sin^{23} x - \cos^{22} x$ and $g(x) = 1 + \frac{1}{2} \tan^{-1} |x|$, then the number of values of x in the interval $[-10\pi, 8\pi]$ satisfying the equation $f(x) = \operatorname{sgn}[g(x)]$ is _____
3. If $f(x) = \frac{(3x^2 + ax + a + 1)}{(x^2 + x - 2)}$ and $\lim_{x \rightarrow -2} f(x)$ exists, then the value of $(a - 4)$ is _____
4. If $g(x) = x^2 + \frac{1}{x^2}$ and $f(g(x)) = x^6 + \frac{1}{x^6}$, then $f'(2)$ equals _____
5. Let f be differentiable for all x . If $f(1) = -2$ and $f'(x) \geq 2$ for all $x \in [1, 6]$, then the minimum value of $f(6)$ is _____
6. If k_0 is the least value of k for which the function $x^2 + kx + 1$ is an increasing function in the interval $1 \leq x \leq 2$, then the value of $|k_0|$ is _____
7. If $f(0) = 1, f(2) = 3$, and $f'(2) = 5$, then the value of $\int_0^1 x f''(2x) dx$ is _____