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JEE (Main + Advanced)					UNIT TEST - 4					
ENTHUSIAST COURSE					01 – 07 – 2018					
TARGET : JEE (Main + Advanced) 2019					TEST PATTERN : JEE (Advanced)					

Time : 3 Hours

Maximum Marks : 183

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

INSTRUCTIONS**A. General :**

1. This booklet is your Questions Paper. Do not break the seals of this booklet before being instructed to do so by the invigilators.
2. Blank spaces and blank pages are provided in this booklet for your rough work. No additional sheets will be provided for rough work.
3. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers, and electronic gadgets are NOT allowed inside the examination hall.
4. The answer sheet, a machine-readable Optical Response Sheet (ORS), is provided separately.
5. DO NOT TAMPER WITH/MUTILATE THE ORS OR THE BOOKLET.

B. Filling the ORS :

6. A candidate has to write his / her answers in the ORS sheet by darkening the appropriate bubble with the help of **Black ball point pen** as the correct answer(s) of the question attempted.
7. Write your Name, FNO and sign with pen in the boxes provided on part of the ORS. **Do not write any of this information anywhere else.**

C. Question Paper Format :

8. The question paper consists of **3 parts** (Physics, Chemistry and Mathematics). Each part consists of **Two Section**. (**Section -I**) & (**Section - IV**)
9. **SECTION-I :**
TYPE (A) : This part contains **7** multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONE** is correct.
TYPE (B) : This part contains **7** multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONE** or **MORE** than **ONE** is/are correct.
10. **SECTION-IV** contains **4** questions. The answer to each question is a single digit integer, ranging from **0** to **9**.

D. Marking scheme :**11. Section – I**

TYPE (A) : For each question in **TYPE (A)**, you will be awarded **3 marks** if you darken the bubble corresponding to the correct answer **ONLY**. **Minus (–1) marks** will be awarded for incorrect answers in this section.

TYPE (B) : For each question in **TYPE (B)**, you will be awarded **4 marks** if you darken the bubble corresponding to the correct answer(s) **ONLY**. In all other cases, **zero(0) marks** will be awarded. **No negative marks** will be awarded for incorrect answers in this section.

12. Section – IV

For each question in **Section – IV**, you will be awarded **3 marks** if you darken the bubble corresponding to the correct answer **ONLY**. **Minus (–1) marks** will be awarded for incorrect answers in this section.

13. Take $g = 10 \text{ m/s}^2$ unless otherwise stated.

Write your Name, Form No. & Sign in the space provided on the back page of this booklet.

PART-1 : PHYSICS
SECTION-I (PART-A) : Single Corret Type

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four option(s) is correct.

1. The magnetic field at the centre of a current carrying ring is B_0 and at a small axial distance x ($\ll R$); R = radius of the ring, is B . Then $\frac{B-B_0}{B_0}$ equals

(A) $\left(\frac{x}{R}\right)^2$ (B) $\frac{3}{2}\left(\frac{x}{R}\right)^2$ (C) $\frac{5}{2}\left(\frac{x}{R}\right)^2$ (D) $\frac{1}{2}\left(\frac{x}{R}\right)^2$

2. Three identical positive charges 'Q' are arranged at the vertices of an equilateral triangle. The side of the triangle is 'a'. The intensity of the field at the vertex of a regular tetrahedron of which the triangle is the base is

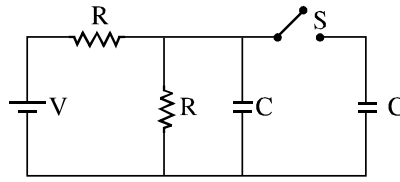
(A) $\frac{1}{4\pi\epsilon_0} \frac{\sqrt{6} Q}{a^2}$ (B) $\frac{1}{4\pi\epsilon_0} \frac{\sqrt{3} Q}{a^2}$ (C) $\frac{1}{4\pi\epsilon_0} \frac{\sqrt{3} Q}{2a^2}$ (D) $\frac{Q}{4\pi\epsilon_0 a^2}$

3. Which of the following quantities do not change when a resistor connected to a battery is heated due to the current ?

(A) drift speed (B) resistivity (C) resistance (D) number of free electrons

Space for Rough Work

4. In the figure shown, initially the switch is open for a long time. Now the switch is closed at $t = 0$. Find the charge on the rightmost capacitor as a function of time, given that it was initially uncharged.



(A) $q = \frac{CV}{2} \left(1 - \frac{1}{2} e^{-\frac{t}{2Rc}} \right)$

(B) $q = \frac{CV}{2} \left(1 - \frac{1}{2} e^{-\frac{t}{Rc}} \right)$

(C) $q = CV \left(1 - \frac{1}{2} e^{-\frac{t}{Rc}} \right)$

(D) $q = \frac{CV}{2} \left(1 - e^{-\frac{t}{Rc}} \right)$

Space for Rough Work

5. Two metal balls of the same radius 'a' are located in a homogeneous poorly conducting medium with resistivity ' ρ '. Find the resistance of the medium between the balls provided that the separation between them is much greater than the radius of the ball.

(A) $\frac{\rho}{\pi a}$

(B) $\frac{\rho}{2\pi a}$

(C) $\frac{\rho}{3\pi a}$

(D) $\frac{\rho}{4\pi a}$

6. In a potentiometer experiment, it is found that no current passes through the galvanometer when the terminals of the cell are connected across 52 cm of the potentiometer wire. If the cell is shunted by a resistance of $5\ \Omega$, a balance is found when the cell is connected across 40 cm of the wire. Find the internal resistance of the cell.

(A) $1\ \Omega$

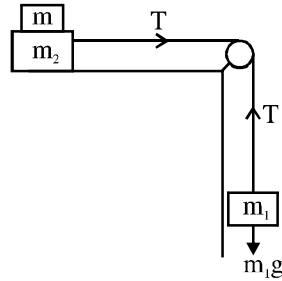
(B) $1.5\ \Omega$

(C) $2\ \Omega$

(D) $2.5\ \Omega$

Space for Rough Work

7. Two masses $m_1 = 5\text{ kg}$ and $m_2 = 10\text{ kg}$, connected by an inextensible string over a frictionless pulley, are moving as shown in the figure. The coefficient of friction of horizontal surface is 0.15. The minimum weight m that should be put on the top of m_2 to stop the motion is :



(A) 18.3 kg

(B) 23.3 kg

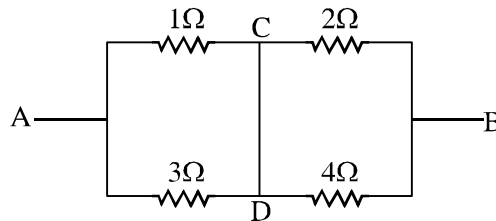
(C) 43.3 kg

(D) 10.3 kg

Space for Rough Work

SECTION-I (PART-B) : Multiple Corret Type

- This section contains **SEVEN** questions.
 - Each question has **FOUR** options (A), ((B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.
8. A long, straight wire carries a current along the z-axis, one can find two points in the x-y plane such that
- (A) the magnetic fields are equal
 - (B) the directions of the magnetic fields are the same
 - (C) the magnitudes of the magnetic fields are equal
 - (D) the field at one point is opposite to that at the other point.
9. A constant voltage $\xi = 25V$ is maintained between points A and B of the circuit as shown in the fig.



- (A) Magnitude of the current in the segment CD is 1A.
- (B) Magnitude of the current in the segment CD is 2A.
- (C) Current in the segment CD is directed from C to D.
- (D) Current in the segment CD is directed from D to C.

Space for Rough Work

10. A particle of mass m is initially at rest at the origin. It is subjected to a force and starts moving along the x -axis. Its kinetic energy K changes with time as $dK/dt = \gamma t$, where γ is a positive constant of appropriate dimensions. Which of the following statements is (are) true ?
- (A) The force applied on the particle is constant
 (B) The speed of the particle is proportional to time
 (C) The distance of the particle from the origin increases linearly with time
 (D) The force is conservative
11. Two infinitely long straight wires lie in the xy -plane along the lines $x = \pm R$. The wire located at $x = +R$ carries a constant current I_1 and the wire located at $x = -R$ carries a constant current I_2 . A circular loop of radius R is suspended with its centre at $(0, 0, \sqrt{3}R)$ and in a plane parallel to the xy -plane. This loop carries a constant current I in the clockwise direction as seen from above the loop. The current in the wire is taken to be positive if it is in the $+\hat{j}$ direction. Which of the following statements regarding the magnetic field \vec{B} is (are) true ?
- (A) If $I_1 = I_2$ then \vec{B} cannot be equal to zero at the origin $(0, 0, 0)$
 (B) If $I_1 > 0$ and $I_2 < 0$, then \vec{B} can be equal to zero at the origin $(0, 0, 0)$
 (C) If $I_1 < 0$ and $I_2 > 0$, then \vec{B} can be equal to zero at the origin $(0, 0, 0)$
 (D) If $I_1 = I_2$, then the z -component of the magnetic field at the centre of the loop is $\left(-\frac{\mu_0 I}{2R}\right)$

Space for Rough Work

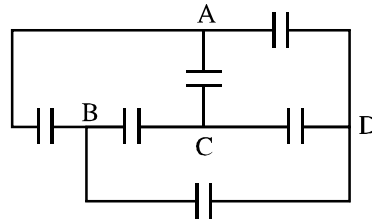
12. The potential energy of a particle of mass 1 kg in a conservative field is given as $U = (3x^2y^2 + 6x)J$, where x and y are measured in metre. Initially particle is at (1, 1) and at rest then:
- (A) Initial acceleration of the particle is $6\sqrt{5}ms^{-2}$
- (B) Work done to slowly bring the particle to origin is 9J
- (C) Work done to slowly bring the particle to origin is $-9J$
- (D) If particle is left free it moves in straight line.
13. Two identical conducting spheres are connected with a conducting spring. If a charge Q is given to one of the spheres :



- (A) It is equally shared between the spheres
- (B) The total potential energy is minimum in equilibrium of the spheres
- (C) The frequency of oscillation of the system changes
- (D) The frequency of oscillation does not depend on charging

Space for Rough Work

14. Between which two points a current source must be connected to the circuit shown in figure in order to charge all the six capacitors having equal capacitances ?



- (A) A and B (B) B and C (C) C and D (D) There are no such points

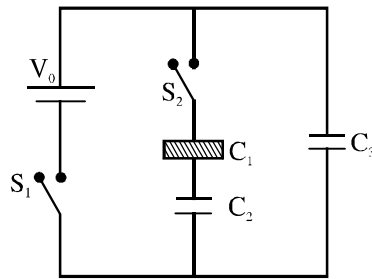
Space for Rough Work

SECTION-IV : INTEGER TYPE

- This section contains **FOUR** questions.
 - The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive
-
1. A satellite is lifted from the earth to a height h . Let the work done by the external agent be w_1 . Then it is projected with a speed so as to move in a circular orbit doing an extra work w_2 . The ratio $\frac{w_1}{w_2} = \frac{nh}{R}$. Find the value of n .
 2. An ammeter and a voltmeter are connected in series to a battery with an emf $\xi = 6.0V$. When a certain resistance is connected in parallel with the voltmeter, the readings of the latter decreases $\eta = 2.0$ times, whereas the readings of the ammeter increases the same number of times. Find the voltmeter readings after the connection of the resistance.

Space for Rough Work

3. A charge q is uniformly distributed inside a sphere of radius R . Assuming that the dielectric constant is equal to unity everywhere, find the ratio of the energy U_2 in the surrounding space to the energy U_1 localized inside the sphere.
4. Three identical capacitors C_1 , C_2 and C_3 have a capacitance of $1.0 \mu\text{F}$ each and they are uncharged initially. They are connected in a circuit as shown in the figure and C_1 is then filled completely with a dielectric material of relative permittivity ϵ_r . The cell electromotive force (emf) $V_0=8\text{V}$. First the switch S_1 is closed while the switch S_2 is kept open. When the capacitor C_3 is fully charged, S_1 is opened and S_2 is closed simultaneously. When all the capacitors reach equilibrium, the charge on C_3 is found to be $5 \mu\text{C}$. The value of $\epsilon_r = \frac{n}{2}$. Find n .

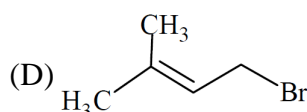
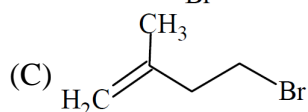
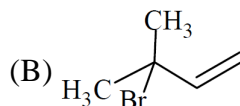
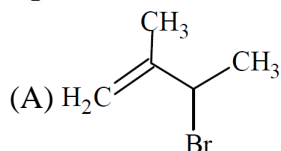
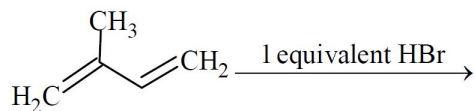


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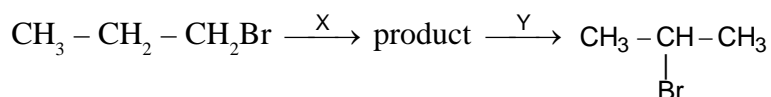
PART-2 : CHEMISTRY
SECTION-I (PART-A) : Single Corret Type

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four option(s) is correct.

1. In the following reaction, the major product is



2. Identify the set of reagents/reaction conditions 'X' and 'Y' in the following set of transformations.



- (A) X = concentrated alcoholic NaOH, 80°C ; Y = HBr acetic acid, 20°C
 (B) X = dil. aq. NaOH, 20°C, Y = HBr / acetic acid, 20°C
 (C) X = dil. aq. NaOH, 20°C, Y = Br₂ / CHCl₃, 0°C
 (D) X = conc. alc. NaOH, 80°C, Y = Br₂ / CHCl₃, 0°C

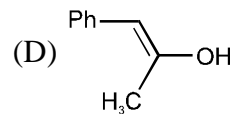
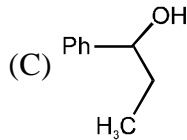
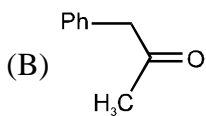
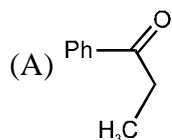
Space for Rough Work

3. $X(C_4H_9Br) \xrightarrow{\text{alc. KOH}} Y \xrightarrow{Br_2} Z \text{ (Dibromide)} \xrightarrow{NaNH_2} W \text{ (gas)} \xrightarrow[\text{Solution}]{AgNO_3} \text{White ppt}$
 X, Y and Z are respectively:

- | | X | Y | Z |
|-----|--|---------------------------|---|
| (A) | $CH_3 - CH_2CH_2CH_2Br$ | $CH_3 - CH = CH - CH_3$ | $CH_3 - \underset{\text{Br}}{\text{CH}} - CH_2 - \underset{\text{Br}}{\text{CH}}$ |
| (B) | $CH_3 - CH_2CH_2CH_2Br$ | $CH_3 - CH_2 - CH = CH_2$ | $CH_3 - CH_2 - \underset{\text{Br}}{\text{CH}} - \underset{\text{Br}}{\text{CH}_2}$ |
| (C) | $CH_3 - \underset{\text{Br}}{\text{CH}} - CH_2 - CH_3$ | $CH_3 - CH = CH - CH_3$ | $CH_3 - CH_2 - \underset{\text{Br}}{\text{CH}} - \underset{\text{Br}}{\text{CH}_2}$ |
| (D) | $CH_3 - CH_2 - \underset{\text{Br}}{\text{CH}} - CH_3$ | $CH_3 - CH_2 - CH = CH_2$ | $CH_3 - CH_2 - \underset{\text{Br}}{\text{CH}} - \underset{\text{Br}}{\text{CH}}$ |

Space for Rough Work

4. $\text{Ph} - \text{C} \equiv \text{C} - \text{CH}_3 \xrightarrow[80^\circ\text{C}]{1\% \text{ HgSO}_4 / 20\% \text{ H}_2\text{SO}_4} \text{A}(\text{major product}), \text{A is :}$



5. Which of the following is **INCORRECT**. (Use Slater's rule to find σ if required)

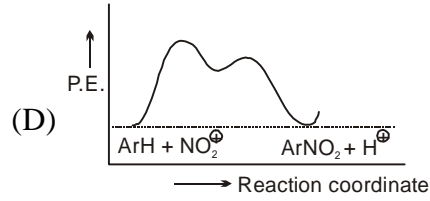
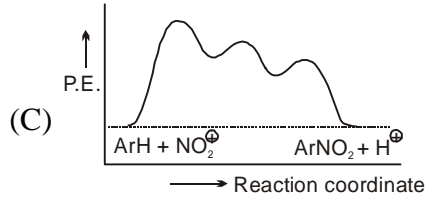
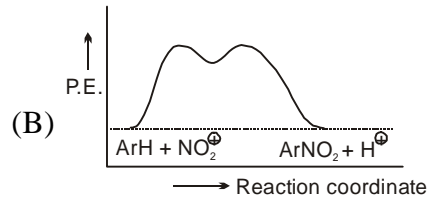
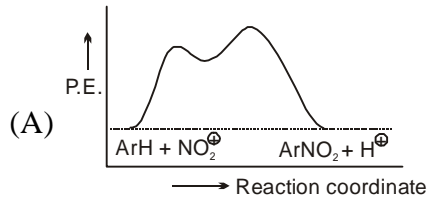
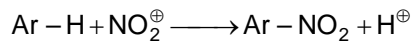
(A) Z_{eff} for 3d electron of Sc ($Z = 21$) = 3.0 (B) Z_{eff} for 4s electron of Sc ($Z = 21$) = 3.0

(C) $Z_{\text{eff}}(\text{F}^-) > Z_{\text{eff}}(\text{F})$

(D) $\sigma(\text{He}) = \sigma(\text{Li}^+)$

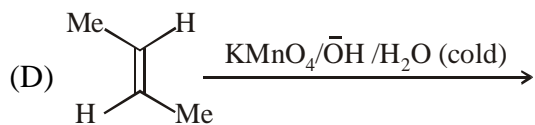
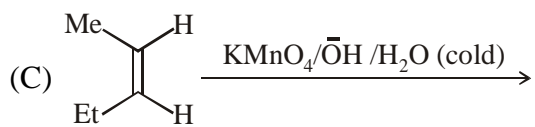
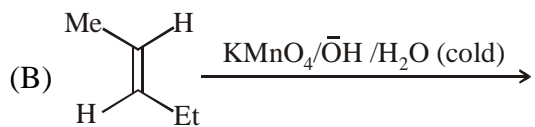
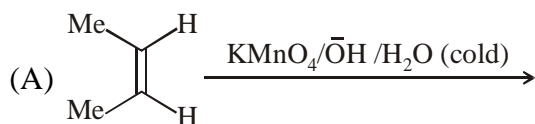
Space for Rough Work

6. The correct energy level diagram for the following reaction is



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7. The reaction among following produces meso-compound

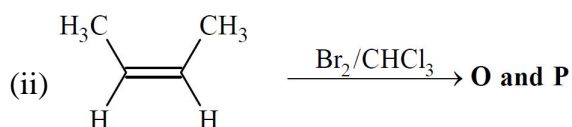
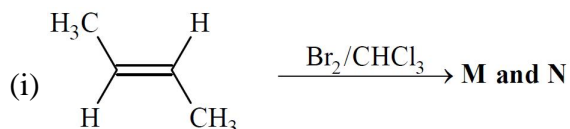


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SECTION-I (PART-B) : Multiple Correct Type

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.

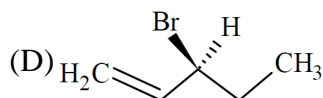
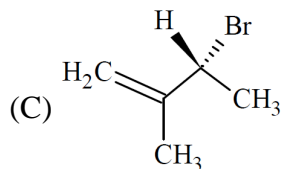
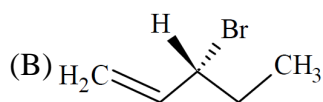
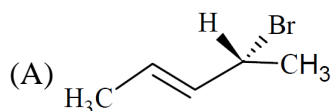
8. The correct statement(s) for the following addition reactions is(are)



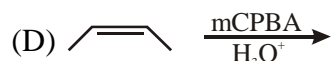
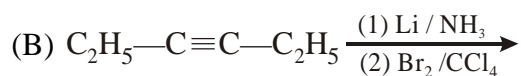
- (A) (**M** and **O**) and (**N** and **P**) are two pairs of diastereomers
 (B) Bromination proceeds through trans-addition in both the reactions
 (C) **O** and **P** are identical molecules
 (D) (**M** and **O**) and (**N** and **P**) are two pairs of enantiomers

Space for Rough Work

9. Compound(s) that on hydrogenation produce(s) optically inactive compound(s) is (are)

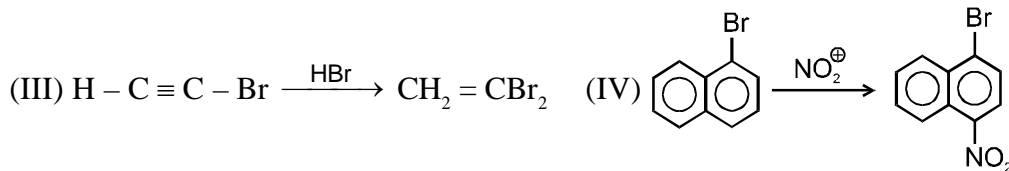
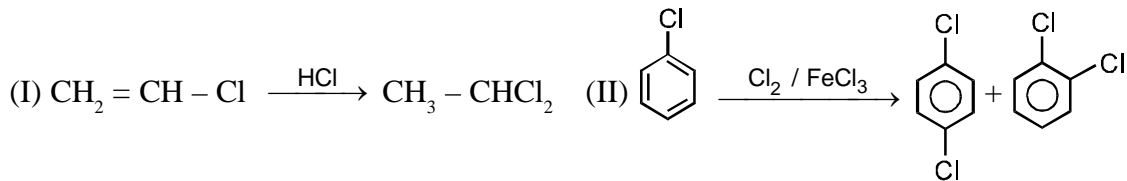


10. In which of the following reaction the resolvable products is / are obtained



Space for Rough Work

11. Which common factor is responsible for the regioselective nature of the following reactions ?



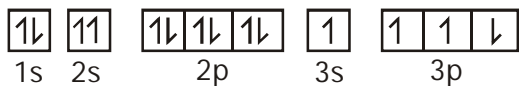
(A) – I effect of halogens

(B) + I effect of halogens

(C) + M effect of halogens

(D) – M effect of halogens

12. Which rule(s) is/are violated if an element's configuration is written as :



(A) Aufbau rule

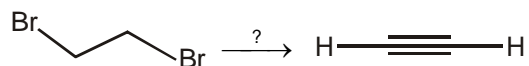
(B) Pauli's rule

(C) Hund's rule

(D) No rule is violated

Space for Rough Work

13. The reagent(s) for the following conversion,



is/are

- (A) NaNH_2 (B) alcoholic KOH followed by NaNH_2
 (C) aqueous KOH followed by NaNH_2 (D) alcoholic KOH at high temperature
14. We have four elements P, Q, R and S. There 1st ($\Delta_i H_1$), 2nd ($\Delta_i H_2$) & 3rd ($\Delta_i H_3$) ionization enthalpies (kJ mol^{-1}) and ($\Delta_{\text{eg}} H$) electron gain enthalpies (kJ mol^{-1}) given below. What conclusion(s) can be drawn correctly from the following data ?

Elements	$\Delta_i H_1$	$\Delta_i H_2$	$\Delta_i H_3$	$\Delta_{\text{eg}} H$
P	520	7300	11815	-60
Q	1402	2856	4518	+0.07
R	1000	1846	3100	-295
S	737	1450	7733	+40

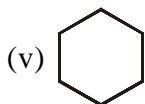
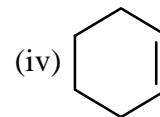
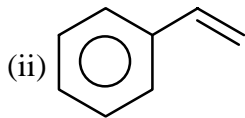
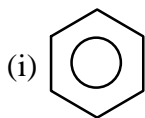
- (A) P is likely to be Lithium (B) Q is likely to be Nitrogen
 (C) R is likely to be Iodine (D) S is likely to be Aluminium

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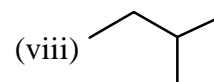
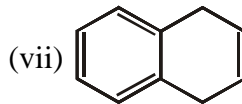
SECTION-IV : INTEGER TYPE

- This section contains **FOUR** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive.

1. Which of the following compounds will decolorise Br_2/CCl_4 solution ?



(vi) But -2-ene



(ix) But-2-yne

 (x) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$

2. From the following list, find the number of species which have their size less than F^-
 $\text{F}, \text{Na}^+, \text{Cl}^-, \text{H}^-, \text{O}^{2-}, \text{I}^-, \text{Mg}^{+2}$
3. Among the following, in how many pairs first element has greater second ionisation energy than second element ?
- | | | | |
|------------|-----------|--------------|--------------|
| (i) Li, Be | (ii) O, F | (iii) Cu, Zn | (iv) Mg, Al |
| (v) Al, Si | (vi) P, S | (vii) Cs, Xe | (viii) Si, P |
4. Total number of elements which have less IE_1 than that of 'N'.
 He, Be, B, C, F, P

Space for Rough Work

PART-3 : MATHEMATICS**SECTION-I (PART-A) : Single Corret Type**

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), ((B), (C) and (D). **ONLY ONE** of these four option(s) is correct.

1. The set of real values of 'k' for which the equation, $|2x + 3| + |2x - 3| = kx + 6$ has more than two solutions is :

- (A) $[0, 4)$ (B) $(-4, 4)$ (C) $\mathbb{R} - \{4, -4, 0\}$ (D) $\{0\}$

2. $\lim_{x \rightarrow 0} \left[\frac{\sin[x-3]}{[x-3]} \right]$, where $[x]$ denotes greatest integer less than or equal to x , is equal to

- (A) 0 (B) 1 (C) $\sin 1$ (D) dose not exist

Space for Rough Work

3. Let $u(x)$ and $v(x)$ are differentiable functions such that $\frac{u(x)}{v(x)} = 7$. If $\frac{u'(x)}{v'(x)} = p$ & $\left(\frac{u(x)}{v(x)}\right)' = q$, then

$\frac{p+q}{p-q}$ has the value equal to

- (A) 1 (B) 0 (C) 7 (D) -7

4. If $f(x) = \max\{2\sin x, 1 - \cos x\} \forall x \in (0, \pi)$, and $\lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a} = 0$, then $a =$

(A) $\frac{5\pi}{12}$

(B) a solution of $2\sin a + \cos a = 1$

(C) $\frac{\pi}{12}$

(D) $\frac{\pi}{2}$

Space for Rough Work

5. The number of values of c such that the straight line $3x + 4y = c$ touches the curve $\frac{x^4}{2} = x + y$ is
- (A) 0 (B) 1 (C) 2 (D) 4
6. Let $S_1 : x^2 + y^2 + 2gx + 2fy + c = 0$ & $S_2 : x^2 + y^2 + 2fx - 2gy - c = 0$ be two given circles and a diameter AB of S_1 meets S_2 in C & D . Value of $\frac{AC \times AD}{AC + AD}$ is
- (A) $\sqrt{g^2 + f^2 - c}$ (B) $2\sqrt{g^2 + f^2 - c}$ (C) $2\sqrt{g^2 + f^2 + c}$ (D) $\sqrt{g^2 + f^2 + c}$
7. Two circles whose radii are equal to 4 and 8 intersect at right angles. Length of one of their common tangents is
- (A) 6 (B) 8 (C) 12 (D) $\sqrt{32}$

Space for Rough Work

SECTION-I (PART-B) : Multiple Correct Type

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.

8. The function defined as
$$f(x) = \lim_{n \rightarrow \infty} \begin{cases} \cos^{2n} x & \text{if } x < 0 \\ \sqrt[n]{1+x^n} & \text{if } 0 \leq x \leq 1 \\ \frac{1}{1+x^n} & \text{if } x > 1 \end{cases}$$

which of the following does not hold good?

- (A) continuous at $x = 0$ but discontinuous at $x = 1$
 - (B) continuous at $x = 1$ but discontinuous at $x = 0$
 - (C) continuous both at $x = 1$ and $x = 0$
 - (D) discontinuous both at $x = 1$ and $x = 0$
9. Which of the following functions has removable discontinuity at $x = 1$?
- (A) $f(x) = \frac{1}{\ln|x|}$
 - (B) $f(x) = \frac{x^2 - 1}{x^3 - 1}$
 - (C) $f(x) = 2^{-2^{1-x}}$
 - (D) $f(x) = \frac{\sqrt{x+1} - \sqrt{2x}}{x^2 - x}$

Space for Rough Work

10. $f(x) = \left(\frac{x}{2+x}\right)^{2x}$, then which of the following is correct?

- (A) $\lim_{x \rightarrow \infty} f(x) = -4$ (B) $\lim_{x \rightarrow \infty} f(x) = 2$ (C) $\lim_{x \rightarrow \infty} f(x) = e^{-4}$ (D) $\lim_{x \rightarrow 1} f(x) = \frac{1}{9}$

11. Let function $f(x)$ be defined as $f(x) = |\sin^{-1}x| + \cos^{-1}\left(\frac{1}{x}\right)$. Then which of the following is/are **TRUE**?

- (A) $f(x)$ is a One-One function in its domain.
(B) $f(x)$ is a Many-One function in its domain.
(C) Range of f is a singleton set.
(D) $\text{sgn}(f(x)) = 1$ where $\text{sgn}(x)$ denotes signum function of x .

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12. If $f(x) = \begin{cases} |x| - 3, & x < 1 \\ |x - 2| + a, & x \geq 1 \end{cases}$ and $g(x) = \begin{cases} 2 - |x|, & x < 2 \\ \text{sgn}(x) - b, & x \geq 2 \end{cases}$ and $h(x) = f(x) + g(x)$ is

discontinuous at exactly one point then which of the following values of a and b are possible

- (A) $a = -3, b = 0$ (B) $a = 2, b = 1$ (C) $a = 2, b = 0$ (D) $a = -3, b = 1$

13. Equation of a tangent to the curve $y \cot x = y^3 \tan x$, at the point $x = \frac{\pi}{4}$, is

- (A) $4x + 2y = \pi + 2$ (B) $4x - 2y = \pi + 2$ (C) $x = 0$ (D) $y = 0$

14. The co-ordinates of the point(s) on the graph of the function, $f(x) = \frac{x^3}{3} - \frac{5x^2}{2} + 7x - 4$ where the tangent drawn cut off intercepts from the co-ordinate axes which are equal in magnitude but opposite in sign, is :

- (A) $(2, 8/3)$ (B) $(3, 7/2)$ (C) $(1, 5/6)$ (D) $(2, 3/2)$

Space for Rough Work

SECTION-IV : INTEGER TYPE

- This section contains **FOUR** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive

1. Find the value of $\tan^{-1}\left(\frac{x \cos 2}{1-x \sin 2}\right) - \cot^{-1}\left(\frac{\cos 2}{x - \sin 2}\right)$, $x > 1$.

2. If $y^3 - 6x^2 + x^3 = 0$, then $\frac{d^2y}{dx^2} + \frac{8x^2}{y^5} =$

Space for Rough Work

3. Find the greatest value of the function $f(x) = (3^{3x-1}) - 2(3^{2x-1}) + (3^{x-1})$ for $x \in [-1, 1]$.
4. Let $f(x) = [x] + |1-x|$, $x \in (-1, 3)$, where $[x]$ denotes the greatest integer less than or equal to x . Find total number of points where $f(x)$ is non differentiable.

Space for Rough Work