

FIITJEE COMMON TEST – 1**PHYSICS, CHEMISTRY & MATHEMATICS****CODE:****Time Allotted: 3 Hours****Maximum Marks: 186**

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

INSTRUCTIONS

Caution: Question Paper CODE as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong CODE or no CODE will give wrong results.

A. General Instructions

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. This question paper contains Three Section.
3. **Section-I** is Physics, **Section-II** is Chemistry and **Section-III** is Mathematics.
4. Each section is further divided into two parts: **Part-A & Part-C**
5. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
6. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

B. Filling of OMR Sheet

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
2. On the OMR sheet, darken the appropriate bubble with HB pencil for each character of your Enrolment No. and write in ink your Name, Test Centre and other details at the designated places.
3. OMR sheet contains alphabets, numerals & special characters for marking answers.

C. Marking Scheme For All Three Parts.

- (i) **Part-A (01 – 05)** contains 5 multiple choice questions which have only one correct answer. Each question carries **+3 marks** for correct answer and **– 1 mark** for wrong answer.

PART – A (06 – 13) contains 8 Multiple Choice Questions which have **One or More Correct** answer.

For each question in the group **Q. 6 – 13** of **PART – A** you will be awarded

Full Marks: +4 If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.

Partial Marks: +1 For darkening a bubble corresponding to **each correct option**, provided NO incorrect option is darkened.

Zero Marks: 0 If none of the bubbles is darkened.

Negative Marks: –1 In all other cases.

For example, if **(A), (C) and (D)** are all the correct options for a question, darkening all these three will result in **+4 marks**; darkening only **(A) and (D)** will result in **+2 marks**; and darkening **(A) and (B)** will result in **–1 marks**, as a wrong option is also darkened.

- (iii) **Part-B (01-05)** contains five (05) Numerical based questions, the answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30) and each question carries **+3 marks** for correct answer and **there will be no negative marking**.

Name of the Candidate : _____

Batch : _____ **Date of Examination :** _____

Enrolment Number : _____

BATCHES – NWCM921X1R, NWCM921A1R, NWCM921B1R, NWCM921C1R, NWCM921D1R, NWCM721O1S, NWCM921X1W, NWCM921X2W, NWCM921X3W, NWCM921X4W, NWCM921A1W, NWCM921A2W, NWCM921A3W, NWCM921A4W, NWCM921A5W, NWCM921B1W, NWCM921C1W, NWCM921C2W, NWCM921D1W, NWCM921E1W,

PART – I: PHYSICS

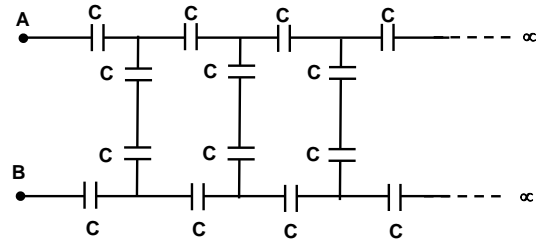
SECTION – A

(Single Correct Choice Type)

This section contains **5 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

1. The equivalent capacitance of the shown infinite network across A and B, if each capacitor has a capacitance of C, is

- (A) $\left(\frac{\sqrt{3}-1}{4}\right)C$
- (B) $\left(\frac{\sqrt{3}+1}{4}\right)C$
- (C) $\left(\frac{\sqrt{5}-1}{4}\right)C$
- (D) $\left(\frac{\sqrt{5}+1}{4}\right)C$

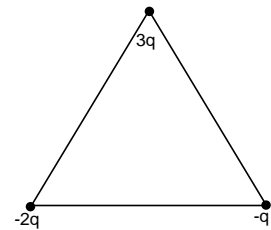


2. The electric flux from a cube of edge l is ϕ . What will be its value if edge of cube is made 2l and charge enclosed is halved?

- (A) 4ϕ
- (B) 2ϕ
- (C) $\phi/2$
- (D) ϕ

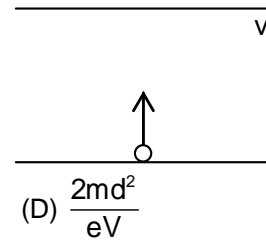
3. 3 points charges are kept on the vertices of an equilateral triangle of side l as shown in figure find out equivalent dipole moment of this charge system.

- (A) $\sqrt{5}ql$
- (B) $\sqrt{7}ql$
- (C) $3ql$
- (D) $\sqrt{19}ql$



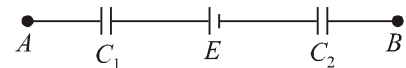
4. An electron having charge e and mass m starts from rest from the lower plate of two metallic plates separated by a distance d. If potential difference between the plates is V, the time taken by the electron to reach the upper plate is given by

- (A) $\sqrt{\frac{2md^2}{eV}}$
- (B) $\sqrt{\frac{md^2}{eV}}$
- (C) $\sqrt{\frac{md^2}{2eV}}$
- (D) $\frac{2md^2}{eV}$



5. For the section AB of a circuit shown in figure, $C_1 = 1 \mu F$, $C_2 = 2 \mu F$, $E = 10 V$ and the potential difference $V_A - V_B = -10V$ charge on capacitor C_1 is:

- (A) $0 \mu C$
- (B) $\frac{20}{3} \mu C$
- (C) $\frac{40}{3} \mu C$
- (D) $\frac{10}{3} \mu C$



(Multi Correct Choice Type)

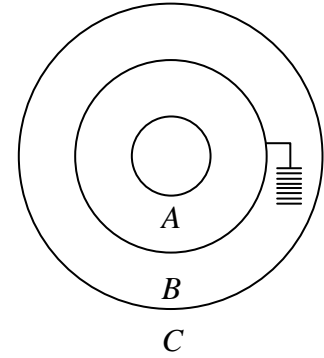
This section contains **8 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

6. A dipole of dipole moment $p\hat{i}$ is placed at P(1, 0) in the field $\vec{E} = 3x^2\hat{i}$. The forces exerted on dipole torque and energy of the dipole are:

- (A) $\vec{F} = 6p\hat{i}$
- (B) $\vec{F} = -6p\hat{i}$
- (C) $U = -3p$
- (D) $\vec{\tau} = 0$

COMMON TEST # 1 – C-XII-3

7. Figure shows three concentric thin spherical shells A, B and C of radii R , $2R$, and $3R$. Shells A and C are given charges q and $2q$ and shell B is earthed. Then

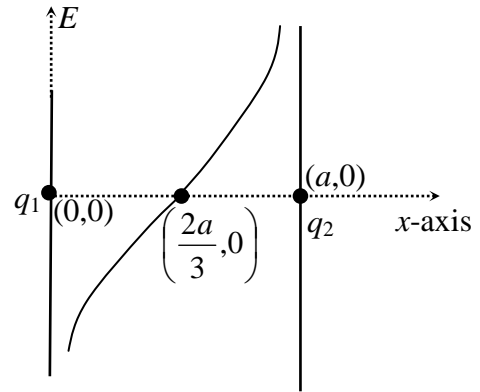


- (A) charge on inner surface of shell C is $\frac{4}{3}q$
- (B) charge on outer surface of shell B is $-\frac{4}{3}q$
- (C) charge on outer surface of shell C is $\frac{2}{3}q$
- (D) charge on outer surface of shell C is $\frac{4}{3}q$

8. Two capacitors of capacitance $3 \mu\text{F}$ and $6 \mu\text{F}$ are charged to a potential of 12 V each. They are now connected to each other, with the positive plate of one to the negative plate of the other. Then

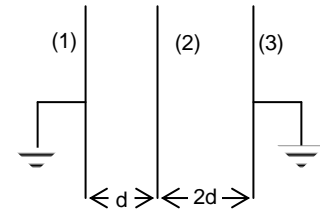
- (A) the potential difference across $3 \mu\text{F}$ is zero
- (B) the potential difference across $3 \mu\text{F}$ is 4 V
- (C) the charge on $3 \mu\text{F}$ is zero
- (D) the charge on $3 \mu\text{F}$ is $12 \mu\text{C}$

9. If the electric field E is plotted, with distance from q_1 along the line joining of two, then (E is positive along +ve x -axis) it looks as shown in figure. From the plot we can say that



- (A) q_1 and q_2 both are negative
- (B) $\left| \frac{q_1}{q_2} \right| = 4$
- (C) q_1 is positive and q_2 is negative
- (D) $\left| \frac{q_1}{q_2} \right| = \frac{1}{4}$

10. Three identical plates of area A are arranged as shown a charge $+Q$ is given to plate (2). Then,

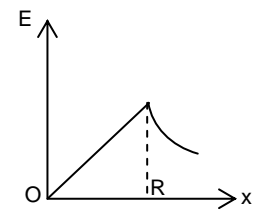


- (A) charge $+2Q/3$ appears on plate 1
- (B) charge $-2Q/3$ appears on plate 1
- (C) charge $-Q/3$ appears on plate 3
- (D) charge on plate 1 + charge on plate 3 = 0

11. Four charges, all of the same magnitude, are placed at the four corners of a square. At the centre of the square, the potential is V and the field is E . By suitable choices of the signs of the four charges, which of the following can be obtained?

- (A) $V = 0, E = 0$
- (B) $V = 0, E \neq 0$
- (C) $V \neq 0, E = 0$
- (D) $V \neq 0, E \neq 0$

12. A sphere has a positive charge. Figure shows variation of electric field (E) with distance x from its centre. From this figure, we conclude that



- (A) Sphere is made of a non conducting materials
- (B) Diameter of sphere is equal to $R/2$
- (C) Electric potential, due to sphere, is maximum at its centre
- (D) Density of charge is uniform throughout the volume of sphere

COMMON TEST # 1 – C-XII-4

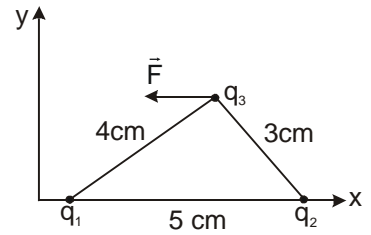
13. Three charges q_1 , q_2 and q_3 are placed as shown. The magnitude of q_1 , is $2\mu\text{C}$, but its sign and the value of the charge q_2 are not known.

Charge q_3 is $+4\mu\text{C}$, and the net force \vec{F} on q_3 is in the negative x direction.

- (A) Charge q_1 is negative.
 (B) Charge q_2 is positive.

(C) The magnitude of charge q_2 is $\frac{27}{32} \mu\text{C}$.

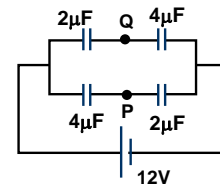
(D) The magnitude of net force \vec{F} on charge q_3 is $\frac{45}{22} \text{ mN}$.



SECTION – C
(Numerical Type)

This section contains **5 questions** Numerical based questions, the answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30)

1. In the figure, the potential difference between P and Q is (in Volt)



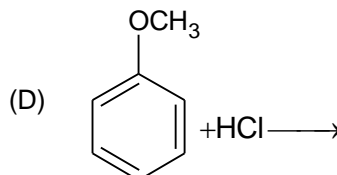
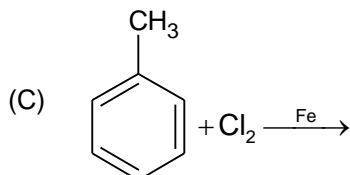
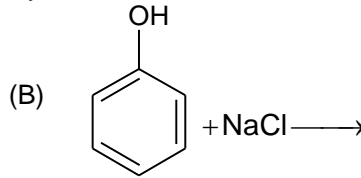
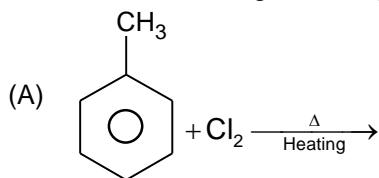
2. A 100 pF capacitor is charged to a potential difference of 24 V . It is connected to an uncharged capacitor of 20 pF . The new potential difference across the 100 pF capacitor is 10 K volt . Find the value of K .
3. In a solid uniformly charged sphere of total charge Q and radius R if energy stored outside the sphere is 2 joules then find out self energy of sphere.
4. Three identical charges are placed at corners of an equilateral triangle of side 5 m . If force between any two charges is 5 N , the work required to double the dimensions of triangle is:
5. A solid conducting sphere of radius 10 cm is enclosed by a thin metallic shell of radius 20 cm . A charge $q = 20 \mu\text{C}$ is given to the inner sphere. Find the heat generated in the process, the inner sphere is connected to the shell by a conducting wire:

Space for rough work

PART – II: CHEMISTRY**SECTION – A****(Single Correct Choice Type)**

This section contains **5 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

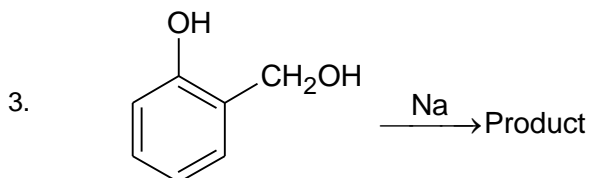
1. Which of the following reaction produces an aryl halide?



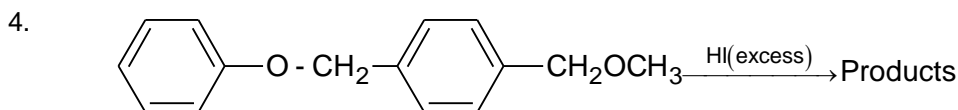
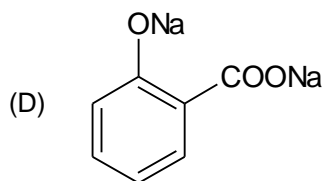
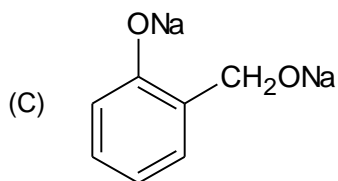
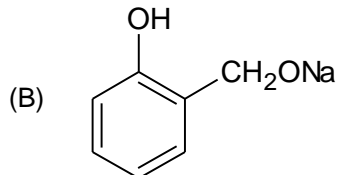
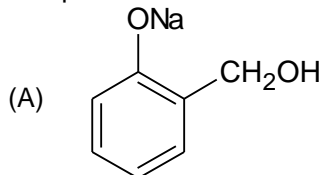
2. $\text{CH}_3\text{Br} + (\text{X}) \longrightarrow \text{P} + \text{Q}$

If the products P and Q are functional isomers, which of the following should be (X)?

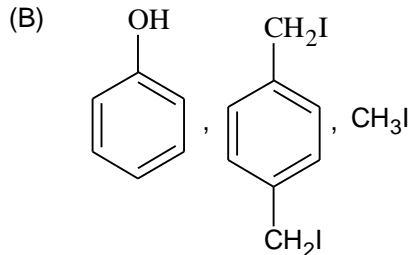
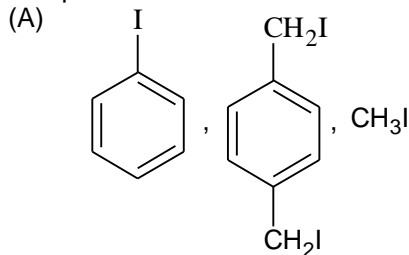
- (A) KOH (B) KNO_2 (C) KSH (D) K_2S



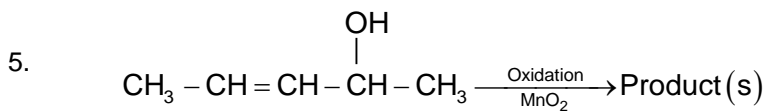
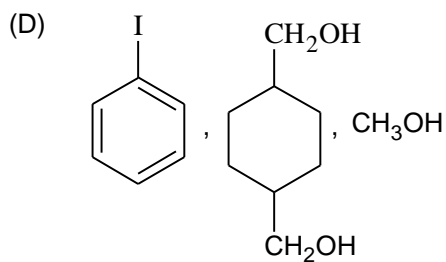
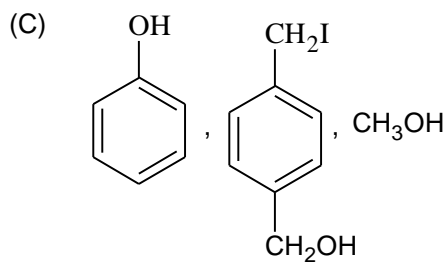
The product of above reaction is



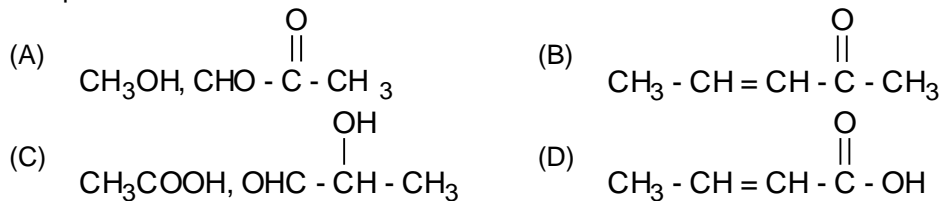
The product of above reaction is/are



COMMON TEST # 1 – C-XII-6



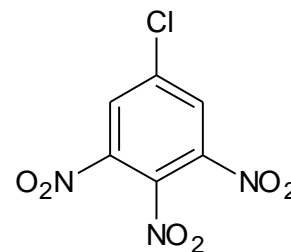
The product of above reaction is/are



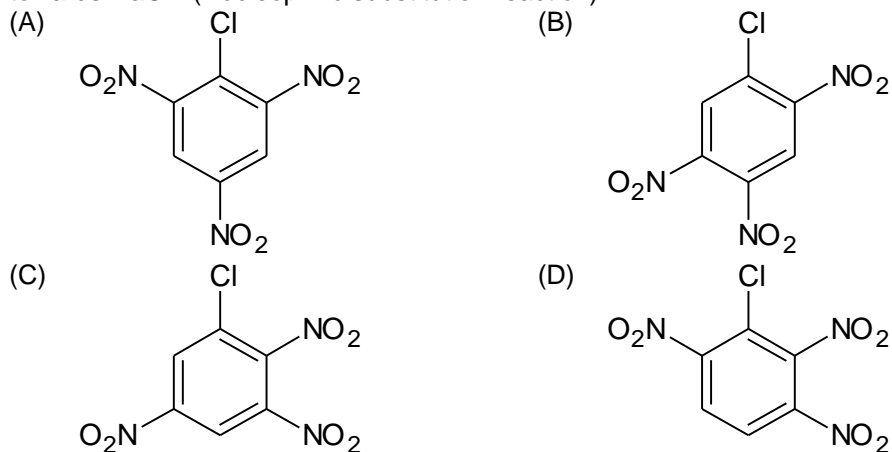
(Multi Correct Choice Type)

This section contains **8 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

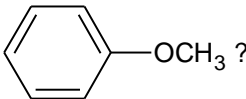
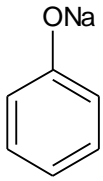
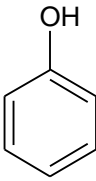
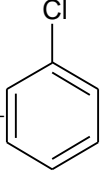
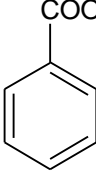


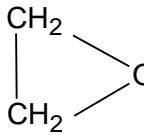
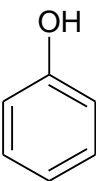
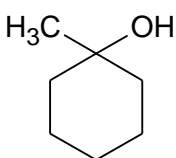
6. Which of the following compound(s) is/are more reactive than



towards NaOH (Nucleophilic substitution reaction)

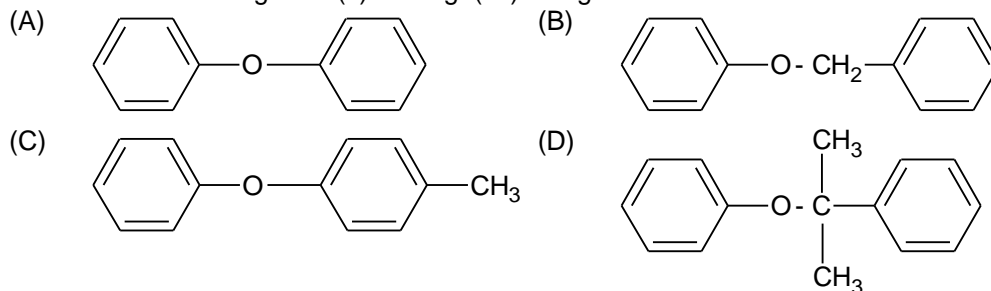


COMMON TEST # 1 – C-XII-7

7. Which of the following reaction(s) can produce  ?
- (A)  + $\text{CH}_3\text{Br} \longrightarrow$
- (B)  + $\text{CH}_2\text{N}_2 \xrightarrow{\text{Heat}}$
- (C) $\text{CH}_3\text{OH} +$  \longrightarrow
- (D)  $\xrightarrow[\text{Ether}]{\text{LiAlH}_4}$
8. Which of the following reaction(s) can produce glycol ($\text{HO} - \text{CH}_2\text{CH}_2 - \text{OH}$) ?
- (A) $\text{CH}_2 = \text{CH}_2 \xrightarrow[\text{Cold}]{\text{KMnO}_4, \text{OH}^-}$
- (B)  + $\text{Aq. KOH} \longrightarrow$
- (C)  + $\text{CrO}_3 \xrightarrow{\text{Oxidation}}$
- (D)  + $\text{H}_2\text{O} \xrightarrow{\text{HCl}}$
9. Which of the following reagent(s) can be used to distinguish between  and  ?
- (A) FeCl_3 (B) $\text{K}_2\text{Cr}_2\text{O}_7/\text{H}^+$ (C) $\text{Br}_2/\text{H}_2\text{O}$ (D) Na
10. Which of the following halide(s) is/are more reactive than $\text{C}_2\text{H}_5\text{Cl}$ towards KCN ? [Assume $\text{S}_{\text{N}}2$ mechanism]
- (A) $\text{C}_2\text{H}_5\text{I}$ (B) CH_3Cl (C) $\text{C}_2\text{H}_5\text{F}$ (D) CH_3Br
11.
$$\text{CH}_3\text{CH}_2\underset{\text{Cl}}{\text{CH}}\text{CH}_3 \xrightarrow[\text{Heat}]{\text{Alcoholic KOH}} \text{P} + \text{Q} + \text{R}$$
- Percentage yield: $\text{P} > \text{Q} > \text{R}$
 Choose the correct statement(s)
- (A) P and Q are geometrical isomers
 (B) Q and R are position isomers
 (C) P and R can produce the same compound when treated with Cl_2/CCl_4
 (D) Q and R can produce the same product when treated with H_2/Ni
12.
$$\text{H}_3\text{C}-\underset{\text{C}_2\text{H}_5}{\overset{\text{H}}{\text{C}}}-\text{OH} + \text{SOCl}_2 \longrightarrow (\text{P}) + \text{SO}_2 + \text{HCl}$$
- The correct statements regarding product(P) is/are
- (A) it is an alkyl chloride
 (B) both reactant and product(P) have same configuration at the chiral carbon atom
 (C) both reactant and product(P) rotate the plane polarized light by equal extent (their degree of rotation are same)
 (D) This is a nucleophilic substitution reaction

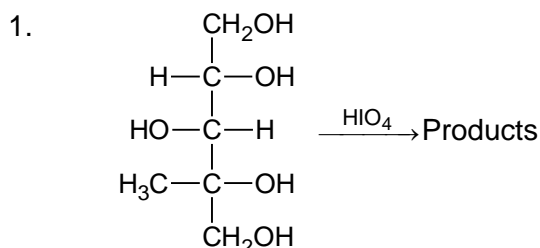
COMMON TEST # 1 – C-XII-8

13. Which of the following ether(s) undergo(es) halogenation when treated with $\text{Cl}_2/\text{sunlight}$ or Cl_2/heat ?

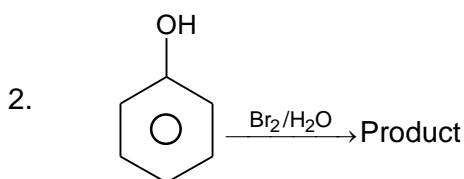


**SECTION – C
(Numerical Type)**

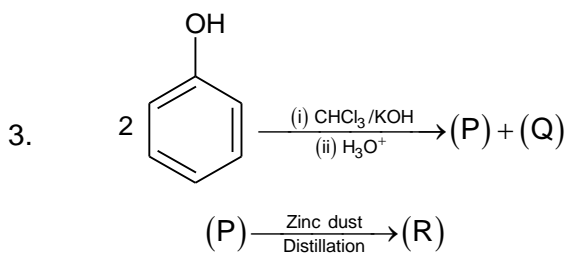
This section contains **5 questions** Numerical based questions, the answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30)



The number of product of above reaction which can form ester with CH_3OH is 2

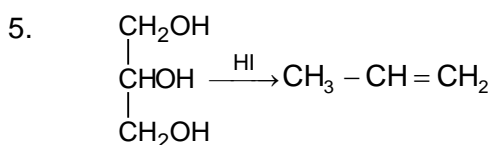


The number of bromine atom present in the above product is 2



If the molar mass difference between products (P) and (R) is X, value of $\frac{X}{5}$ is

4. A saturated alkyl polychloride on hydrolysis produces a β -keto acid (it contains one keto and one monocarboxylic acid group). How many chlorine atoms should be present in that alkyl chloride? Number of chlorine atoms that should be present in that alkyl chloride is 2



Number of moles of HI consumed in above reaction per mole of reactant is 2

Space for rough work

PART – III: MATHEMATICS**SECTION – A****(Single Correct Choice Type)**

This section contains **5 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

1. Let $g(x) = \begin{cases} 3x^2 - 4\sqrt{x} + 1 & \text{for } x < 1 \\ ax + b & \text{for } x \geq 1 \end{cases}$
- If $g(x)$ is continuous and differentiable for all numbers in its domain then:
 (A) $a = b = 4$ (B) $a = b = -4$ (C) $a = 4$ and $b = -4$ (D) $a = -4$ and $b = 4$
2. The left hand derivative of, $f(x) = [x]\sin(\pi x)$ at $x = k, k$ an integer is: (where $[]$ denotes the greatest function)
 (A) $(-1)^k, (k-1)\pi$ (B) $(-1)^{k-1} (k-1)\pi$ (C) $(-1)^k k\pi$ (D) $(-1)^{k-1} k\pi$
3. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a continuous onto function satisfying $f(x) + f(-x) = 0, \forall x \in \mathbb{R}$. If $f(-3) = 2$ and $f(5) = 4$ in $[-5, 5]$, then the equation $f(x) = 0$ has:
 (A) exactly three real roots (B) exactly two real roots
 (C) at least five real roots (D) at least three real roots
4. Solve $2x^2 - 5x + 2 = \frac{5 - \sqrt{9 + 8x}}{4}$, where $x < \frac{5}{4}$
 (A) $x = \frac{3 - \sqrt{5}}{2}$ (B) $x = \frac{3 + \sqrt{5}}{2}$ (C) $x = \frac{-3 - \sqrt{5}}{2}$ (D) None of these
5. The period of $\sin \frac{\pi}{4}[x] + \cos \frac{\pi x}{2} + \cos \frac{\pi}{3}[x]$, where $[x]$ denotes the integral part of x is
 (A) 8 (B) 12 (C) 24 (D) Non – periodic

(Multi Correct Choice Type)

This section contains **8 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

6. Let $A = \mathbb{R} - \{3\}, B = \mathbb{R} - \{1\}$. Let $f: A \rightarrow B$ be defined by $f(x) = \frac{x-2}{x-3}$. Then
 (A) f is bijective (B) f is one – one
 (C) f is onto (D) one – to – one but not onto
7. If $f(x) = x \frac{e^{[x]+|x|} - 2}{[x] + |x|}$ then (where $[.]$ is G.I.F)
 (A) $\lim_{x \rightarrow 0^+} f(x) = -1$ (B) $\lim_{x \rightarrow 0^+} f(x) = 0$
 (C) $\lim_{x \rightarrow 0^+} f(x)$ does not exist (D) $\lim_{x \rightarrow 0} f(x)$ does not exist

COMMON TEST # 1 – C-XII-10

8. The $\lim_{x \rightarrow 0} x^8 \left[\frac{1}{x^3} \right]$ (where $[x]$ is greatest integer function) is
 (A) a nonzero real number (B) a rational number
 (C) an integer (D) zero
9. If $\lim_{x \rightarrow 0} \frac{a \sin x - bx + cx^2 + x^3}{2x^2 \log(1+x) - 2x^3 + x^4}$ exists and is finite, then
 (A) $a = b$ (B) $c = 0$ (C) $a = 6$ (D) $c = 2$
10. Let $f(x) = \begin{cases} \frac{(1 - \cos 4x) \tan x}{x^3} & \text{if } x < 0 \\ 2a^2 & \text{if } x = 0 \\ \frac{\sqrt{x}}{\sqrt{16 + \sqrt{x}} - 4} & \text{if } x > 0 \end{cases}$
 The possible value of a so that f is a continuous is
 (A) 4 (B) 2 (C) -2 (D) not possible
11. $f(x) = |x| + |\sin x|$ in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$. It is
 (A) continuous nowhere (B) continuous everywhere
 (C) differentiable nowhere (D) differentiable everywhere except at $x = 0$
12. Let $f(x) = \frac{x^2 - 9x + 20}{x - [x]}$ (where $[x]$ denotes greatest integer less than or equal to x), then
 (A) $\lim_{x \rightarrow 5^-} f(x) = 0$ (B) $\lim_{x \rightarrow 5^+} f(x) = 1$
 (C) $\lim_{x \rightarrow 5} f(x)$ does not exist (D) none of these
13. If $f(x) = \frac{\cos 2 - \cos 2x}{x^2 - |x|}$, then
 (A) $\lim_{x \rightarrow 1} f(x) = 2 \sin 2$ (B) $\lim_{x \rightarrow 1} f(x) = -2 \sin 2$
 (C) $\lim_{x \rightarrow -1} f(x) = 2 \sin 2$ (D) $\lim_{x \rightarrow 1} f(x) = 2 \cos 2$

**SECTION – C
(Numerical Type)**

This section contains **5 questions** Numerical based questions, the answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30)

1. Let $f(x) = \begin{cases} ax + 1 & \text{if } x < 1 \\ 3 & \text{if } x = 1 \\ bx^2 + 1 & \text{if } x > 1 \end{cases}$. If $f(x)$ is continuous at $x = 1$ then $(a - b)$ is equal to:
2. If $f(x) = \sqrt{x}$, $g(x) = \frac{x}{4}$ and $h(x) = 4x - 8$, then $h \circ g \circ f(x) = \sqrt{x} - k$, where k equal to

COMMON TEST # 1 – C-XII-11

3. Let $f(x) = \frac{x - [x]}{1 + x - [x]}$, $x \in \mathbb{R}$, then the range of f is $\left[0, \frac{1}{k}\right)$ where k is (where $[x]$ is greatest integer function)

4. Find the value of $f(0)$ for which $f(x) = \frac{64(\sqrt{x+4} - 2)}{\sin 2x}$ is continuous.

5. Let $f(x) = \begin{cases} e^{-\frac{1}{x^2}} \sin \frac{1}{x} & x \neq 0 \\ 0 & x = 0 \end{cases}$, then $f'(0) =$

Space for rough work

FIITJEE COMMON TEST - I

BATCHES –NWCM921X1R, NWCM921A1R, NWCM921B1R, NWCM921C1R, NWCM921D1R, NWCM721O1S, NWCM921X1W, NWCM921X2W, NWCM921X3W, NWCM921X4W, NWCM921A1W, NWCM921A2W, NWCM921A3W, NWCM921A4W, NWCM921A5W, NWCM921B1W, NWCM921C1W, NWCM921C2W, NWCM921D1W, NWCM921E1W, NWCM921F1W, PANINI921-XIIG1, PANINI921-XII1 PANINI921-XII2 & PANINI921-XIIB

ANSWERS KEY

QP Code:

Physics

SECTION – A

- | | | | |
|---------|--------|----------|---------|
| 1. C | 2. C | 3. B | 4. A |
| 5. C | 6. ACD | 7. ABC | 8. BD |
| 9. AB | 10. BC | 11. ABCD | 12. ACD |
| 13. ABC | | | |

SECTION – C

- | | | | |
|------|------|---------|----------|
| 1. 4 | 2. 2 | 3. 2.40 | 4. 37.50 |
| 5. 9 | | | |

Chemistry

SECTION – A

- | | | | |
|---------|---------|---------|---------|
| 1. C | 2. B | 3. C | 4. B |
| 5. B | 6. ABCD | 7. AB | 8. ABD |
| 9. ABC | 10. ABD | 11. ABD | 12. ABD |
| 13. BCD | | | |

SECTION – C

- | | | | |
|---------|---------|---------|---------|
| 1. 1.50 | 2. 1.50 | 3. 3.20 | 4. 2.50 |
| 5. 2.50 | | | |

MATHEMATICS

SECTION – A

- | | | | |
|--------|--------|--------|---------|
| 1. C | 2. A | 3. D | 4. A |
| 5. C | 6. ABC | 7. ABD | 8. BCD |
| 9. ABC | 10. BC | 11. BD | 12. ABC |
| 13. AC | | | |

SECTION – C

- | | | | |
|------|------|------|------|
| 1. 0 | 2. 8 | 3. 2 | 4. 8 |
| 5. 0 | | | |