

**FIITJEE COMMON TEST – 9**MONTHLY  
ASSESSMENT**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-C (01 – 05)** contains 5 Numerical based questions with single digit integer as answer, ranging from 0 to 9 and each question carries **+3 marks** for correct answer. There is no negative marking.

**Name of the Candidate :** \_\_\_\_\_

**Batch :** \_\_\_\_\_ **Date of Examination :** \_\_\_\_\_

**Enrolment Number :** \_\_\_\_\_

BATCHES – NWCM82201S, NWCM2022X1R, NWCM2022Y1R, NWCM2022A1R, NWCM2022A1W, NWCM2022A2W, NWCM2022A3W, NWCM2022A4W, NWCM2022X1W, NWCM2022Y1W, NWCM2022Z1W, NWCM2022XA1W, NWCM2022XA2W, PANINI2022-XI 1, PANINI2022-XI 2, & PANINI2022-G 1

**PART – I: PHYSICS**

**SECTION – A**

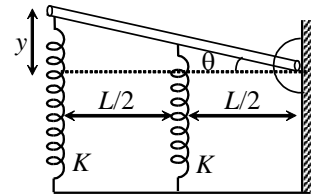
(Single Correct Choice Type)

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 equation of a particle executing SHM is given by  $x = 3 \cos\left(\frac{\pi}{2}\right)t$  cm, where t is in second. The distance travelled by the particle in the first 8.5 s is  
 (A)  $\left(24 + \frac{3}{\sqrt{2}}\right)$ cm    (B)  $\left(27 - \frac{3}{\sqrt{2}}\right)$ cm    (C)  $\left(24 - \frac{3}{\sqrt{2}}\right)$ cm    (D)  $\left(27 + \frac{3}{\sqrt{2}}\right)$ cm

1. **B**

2. A long uniform rod of length L, mass M is free to rotate in a horizontal plane about a vertical axis through its end. Two springs of constant K each are connected as shown. On equilibrium, the rod was horizontal. The frequency of oscillation will be



- (A)  $\frac{1}{2\pi} \sqrt{\frac{15K}{M}}$     (B)  $\frac{1}{2\pi} \sqrt{\frac{15}{4M}}$     (C)  $\frac{1}{2\pi} \sqrt{\frac{3K}{4M}}$     (D)  $\frac{1}{2\pi} \sqrt{\frac{15K}{4M}}$

2. **D**

3. A sinusoidal wave is propagating in negative x direction in a string stretched along x axis. A particle of string of  $x = 2$  m is found at its mean position and its it moving in positive y direction at  $t = 1$  sec. The amplitude of the wave, the wave length and angular frequency of the wave are 0.1 meter,  $\frac{\pi}{4}$  meter and  $4\pi$  rad/s respectively. The instantaneous power transfer through  $x = 2$ m and  $t = 1.125$  second is  
 (A) 0    (B) 1    (C) 2    (D) none of these

3. **A**

4. A source of sound of single frequency  $\nu_0$  flies along a straight line which is at a finite distance from the observer. Then the observer hears  
 (A) a frequency  $\nu_0$  at the instant when the source is nearest to him.  
 (B) a frequency greater than  $\nu_0$  at the instant when the source is nearest to him.  
 (C) a frequency  $\nu_0$  at an instant later than the instant of nearest position of the source.  
 (D) during the fly past, the increase in frequency is not equal to the decrease in the frequency.

4. **A**

5. The power of sound from a speaker is raised from 10 mW to 500 mW. What is the power increased in (decibel) dB as compared to initial original power is ( $\log 50 = 1.69$ )  
 (A) 1.6 dB    (B) 50 dB  
 (C) 16.9 dB    (D) 6.9 dB

5. **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.

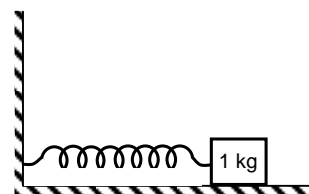
6. A particle of mass  $m$  moves in a straight line. If  $v$  is the velocity at a distance  $x$  from a fixed point on the line and  $v^2 = a - bx^2$ , where  $a$  and  $b$  are constant, then  
 (A) the motion continues along the positive  $x$ -direction only  
 (B) the motion is simple harmonic  
 (C) the particle oscillates with a frequency equal to  $\frac{\sqrt{b}}{2\pi}$   
 (D) the total energy of the particle is  $ma$

6. **BC**

7. Which of the following are correct?  
 (A) For a very small deformation of a material, the ratio of stress and strain is constant as deformation decreases.  
 (B) For a large deformation of a material, the ratio of stress and strain may decrease or increase as deformation decreases.  
 (C) Two wires made of different materials, having the same diameter and length are connected end to end. A force is applied which stretches their combined length by 2 mm. Now the strain is same in both the wire but stress is different.  
 (D) None of these

7. **AB**

8. In the system as shown mass of the block is 1 kg and spring constant is 25 N/m. The maximum kinetic energy of the block is 50 J.  
 (A) the amplitude of oscillation is 2 m.  
 (B) at half of the amplitude, kinetic energy of the block is 37.5 J.  
 (C) at half of the amplitude, potential energy of the spring is 12.5 J.  
 (D) at half of the amplitude, potential energy of the spring is 20 J.

8. **ABC**

9. Density of liquid varies with depth as  $\rho = \alpha h$ . A small ball of density  $\rho_0$  is released from the free surface of the liquid. Then  
 (A) the ball will execute SHM of amplitude  $\frac{\rho_0}{\alpha}$   
 (B) the mean position of the ball will be at a depth  $\frac{\rho_0}{2\alpha}$  from the free surface  
 (C) the ball will sink to a maximum depth of  $\frac{2\rho_0}{\alpha}$   
 (D) all of the above

9. **AC**

10. Two waves travelling in opposite directions produce a standing wave. The individual wave functions are given by  $y_1 = 4 \sin(3x - 2t)$  and  $y_2 = 4 \sin(3x + 2t)$  cm, where  $x$  and  $y$  are in cm  
 (A) The maximum displacement of the motion at  $x = \frac{3\pi}{4}$  cm is 4 cm.  
 (B) The maximum displacement of the motion at  $t = \frac{\pi}{6}$  sec is  $4\sqrt{2}$  cm.  
 (C) Nodes are formed at  $x$  values given by  $0, \pi/3, 2\pi/3, \pi, 4\pi/3, \dots$

**COMMON TEST # 9 – C-XI-4**

(D) Antinodes are formed at x values given by  $\pi/6, \pi/2, 5\pi/6, 7\pi/6, \dots$

10. **CD**

11. A string of variable linear mass density  $\lambda$  is hung through ceiling. A transverse pulse generated at bottom is found to have constant speed  $v$  throughout the length of string. What is the ratio of linear mass density at midpoint to that at the top of string?

- (A)  $e^{gL/2v^2}$  (B)  $e^{gL/4v^2}$   
 (C)  $e^{-gL/2v^2}$  (D)  $e^{-gL/4v^2}$

11. **C**

12. Sounds from two identical sources  $S_1$  and  $S_2$  reach a point P. when the sounds reach directly and in the same phase the intensity at P is  $I_0$ . The power of  $S_1$  is now reduced by 64% and the phase difference between  $S_1$  and  $S_2$  is varied continuously. the maximum and minimum intensities recorded at P are now  $I_{\max}$  and  $I_{\min}$

- (A)  $I_{\max} = 0.64 I_0$  (B)  $I_{\min} = 0.36 I_0$   
 (C)  $I_{\max} / I_{\min} = 16$  (D)  $I_{\max} / I_{\min} = 1.64 / 0.36$

12. **AC**

13. A particle is executing SHM with amplitude A. At displacement  $x = \frac{-A}{4}$ , force acting on the particle is F, potential energy of the particle is U, velocity of particle is v and kinetic energy is K. Assuming potential energy to be zero at mean position. At displacement  $x = \frac{A}{2}$

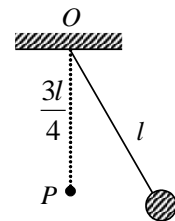
- (A) force acting on the particle will be  $-2F$  (B) potential energy of particle will be  $4U$   
 (C) velocity of particle will be  $\pm\sqrt{\frac{4}{5}}v$  (D) kinetic energy of particle will be  $0.8K$

13. **ABCD**

**SECTION – C**  
**(Integer Type)**

This section contains **5 questions**. The answer to each question is a **single-digit integer**, ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled.

1. A pendulum has time period T for small oscillations. An obstacle P is situated below the point of suspension O at a distance  $\frac{3l}{4}$ . The pendulum is released from rest. Throughout the motion the moving string makes small angle with vertical. If the time after which the pendulum returns back to its initial position is  $\frac{nT}{4}$ . Then find the value of 'n'.



1. **3**

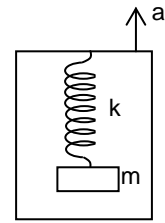
2. A particle moving with SHM in a straight line has a speed of 6 m/s when 4 m from the centre of oscillations and a speed of 8 m/s when 3 m from the centre. Find the amplitude in meter of oscillation.

2. **5**

**COMMON TEST # 9 – C-XI-5**

3. A spring mass system is hanging from the ceiling of an elevator in equilibrium. The elevator suddenly starts accelerating upwards with acceleration "a". If the time period

of oscillation is  $2\pi \sqrt{\frac{m}{k + n \frac{a}{g}}}$  then, find the value of 'n'.



3. **0**

4. A uniform elastic rod is rotated uniformly about an axis perpendicular to its length. The ratio of the change in length of the rod in the two situations (a) the axis passing through one end of rod, (b) axis passing through centre of the rod.

4. **4**

5. A tuning fork of frequency 340 Hz is vibrated just above a cylindrical tube of length 130 cm. Water is slowly poured in the tube. If the speed of sound is  $340 \text{ ms}^{-1}$  then the minimum height of water required for resonance is (in cm).

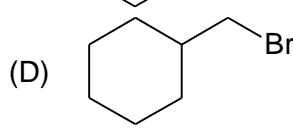
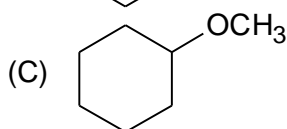
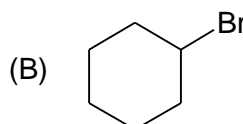
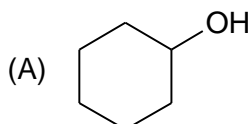
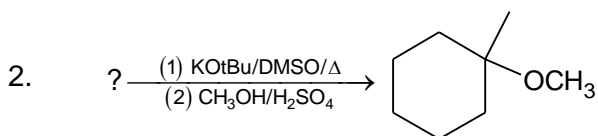
5. **5**

**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. When 2-methyl-2-butene is reacted with  $\text{Cl}_2$  in  $\text{H}_2\text{O}$ , the major product is 3-chloro-2-methyl-2-butanol. This is because
- (A) A carbocation rearrangement occurs  
 (B) Water adds giving carbocation intermediate than then reacts with chloride ion  
 (C) This is an example of radical reaction  
 (D) Chlorine adds forming cyclic halonium ion that is opened when water acts as nucleophile

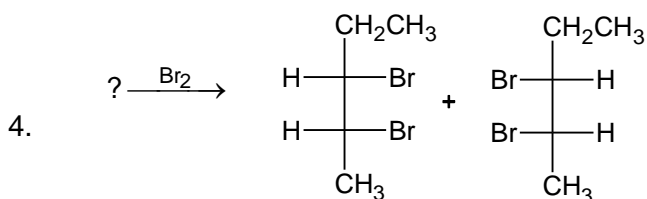
1. D



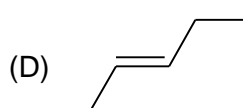
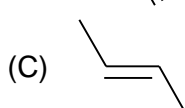
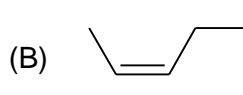
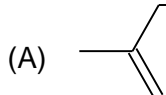
2. D

3. When an internal alkyne reacts with excess  $\text{HCl}$ , the product is geminal dichloride because
- (A) this is radical halogenation and proceeds via most stable radical  
 (B) a carbocation rearrangement occurs  
 (C) halogenation can stabilise carbocation by resonance  
 (D) the reaction shows anti-Markovnikov selectivity

3. C

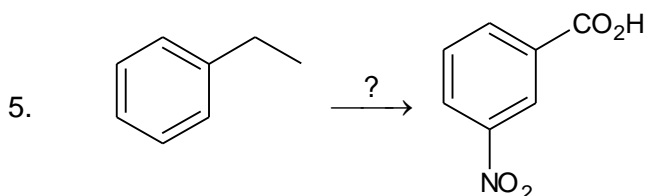


(50 : 50 enantiomers)



4. D

COMMON TEST # 9 – C-XI-7



- (A) (i)  $\text{HNO}_3/\text{H}_2\text{SO}_4$  (ii)  $\text{KMnO}_4/\text{H}_3\text{O}^+/\text{heat}$   
 (B) (i)  $\text{KMnO}_4/\text{H}_3\text{O}^+/\text{heat}$  (ii)  $\text{NaNO}_2/\text{H}_2\text{SO}_4$   
 (C) (i)  $\text{KMnO}_4/\text{H}_3\text{O}^+/\text{heat}$  (ii)  $\text{HNO}_3/\text{H}_2\text{SO}_4$   
 (D) (i)  $\text{NaNO}_2/\text{H}_2\text{SO}_4$  (ii)  $\text{KMnO}_4/\text{H}_3\text{O}^+/\text{heat}$

5. C

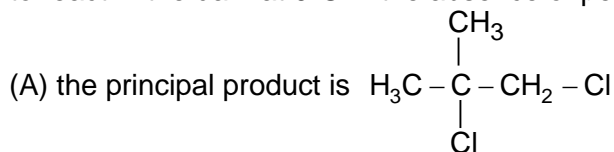
(Multi Correct Choice Type)

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. Which of the following hydrocarbon can discharge the reddish-brown colouration of  $\text{Br}_2$  dissolve in  $\text{CCl}_4$   
 (A) cyclohexane (B) cyclopropane  
 (C) ethylene (D) isobutylene

6. BCD

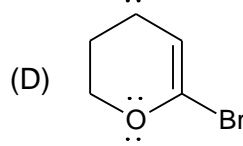
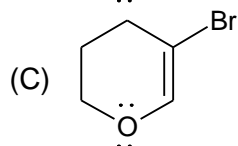
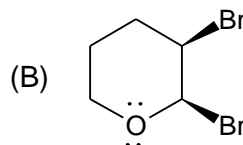
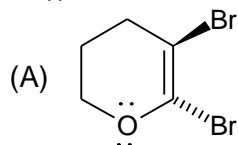
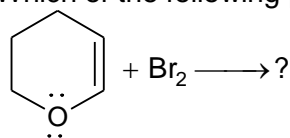
7. Which of the following statement(s) is/are correct when isobutylene and chlorine are allowed to react in the dark at  $0^\circ\text{C}$  in the absence of peroxide?



- (B) the principal product is 3-chloro-2-methyl-1-propene  
 (C) the principal product is formed by radical mechanism  
 (D) the principal product is formed by ionic mechanism

7. BD

8. Which of the following product(s) is/are formed in the reaction shown below

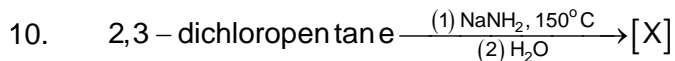


8. AB

COMMON TEST # 9 – C-XI-8

9. Which of the following statement(s) is/are correct for Friedel-Craft reaction?  
 (A) During F.C alkylation, polyalkylation occurs  
 (B) For F.C alkylation, catalytic amount of lewis acid is enough  
 (C) For F.C acylation, more than one equivalent of lewis acid is required  
 (D) Organic compounds like nitrobenzene and aniline do not undergo F.C reaction

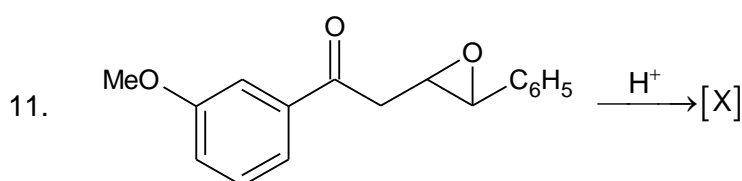
9. ABCD



Which of the following statement(s) is/are correct for [X]?

- (A) The principal product [X] is 2-pentyne  
 (B) The principal product [X] is 1-pentyne  
 (C) The red ppt. is formed when [X] is treated with ammonical cuprous chloride  
 (D) [X] on treatment with  $\text{HgSO}_4/\text{H}_2\text{SO}_4$  yields ketone

10. BCD

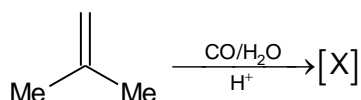


Which of the following is/are correct statement(s) for [X]

- (A) [X] is disubstituted anthracene  
 (B) [X] is trisubstituted naphthalene  
 (C) The formation of [X] involves tautomerism in one step  
 (D) [X] contains two heteroatoms

11. BCD

12. For the reaction



Which of the following statement(s) is/are correct for [X].

- (A) The [X] is  $\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{C}-\text{CHO} \\ | \\ \text{Me} \end{array}$   
 (B) The [X] is  $\begin{array}{c} \text{Me} \\ | \\ \text{Me}-\text{C}-\text{COOH} \\ | \\ \text{Me} \end{array}$

- (C) The formation of [X] involves one electrophilic addition, two nucleophilic addition and finally acid-base reaction.  
 (D) The formation of [X] involves one electrophilic addition, one nucleophilic addition and lastly acid-base reaction.

12. BC



COMMON TEST # 9 – C-XI-9

13. The simplest alkene[X] on reductive ozonolysis yields sole product hexandial. Which of the following statement(s) is/are correct for [X]  
 (A) The mol. wt of alkene is 82 (B) The alkene contains at least 12 carbons  
 (C) The alkene is cyclic (D) The alkene is acyclic

13. AC

SECTION – C  
 (Integer Type)

This section contains **5 questions**. The answer to each question is a **single-digit integer**, ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled.

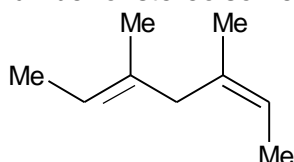
1. How many constitutional isomer are possible for trimethylcyclohexane.

1. 6

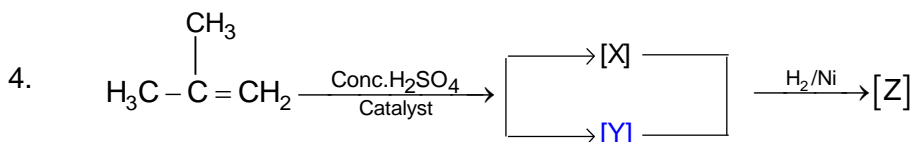
2. How many nitroalkanes are formed if propane is treated with vapour of nitric acid at 450°C.

2. 4

3. Catalytic hydrogenation of the following compound produces saturated hydrocarbon. What is the number of stereoisomers so formed?

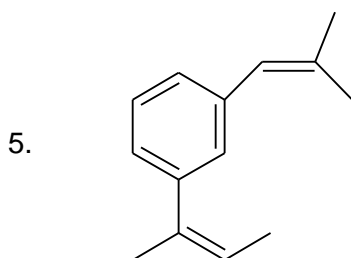


3. 3



How many carbon(s) are in the main chain of Z?

4. 5



How many maximum number of product(s) is/are formed when the above compound undergoes reductive ozonolysis at room temperature?

5. 3

*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. The coefficient of  $t^{50}$  in  $(1+t)^{41}(1-t+t^2)^{40}$  is equal to  
 (A) 1 (B) 50  
 (C) 81 (D) 0
  
1. D
  
2. If  $z \neq 0$ ,  $\operatorname{Re} z = 0$ , then which of the following is always correct?  
 (A)  $\operatorname{Re}(z^2) = 0$  (B)  $\operatorname{Im}(z^2) = 0$   
 (C)  $\operatorname{Re}(z^2) = \operatorname{Im}(z^2)$  (D) none of these
  
2. B
  
3. The general solution of the equation  $(\sqrt{3}-1)\sin\theta + (\sqrt{3}+1)\cos\theta = 2$  is  
 (A)  $2n\pi \pm \frac{\pi}{4} + \frac{\pi}{12}$  (B)  $2n\pi \pm \frac{\pi}{2} + \frac{\pi}{12}$   
 (C)  $2n\pi \pm \frac{\pi}{4} - \frac{\pi}{12}$  (D)  $2n\pi \pm \frac{\pi}{2} - \frac{\pi}{12}$
  
3. A
  
4. If  $\pi < \alpha < \frac{3\pi}{2}$  and  $z = -1 + i \tan \alpha$ , then  $|z| =$   
 (A)  $\operatorname{cosec} \alpha$  (B)  $-\operatorname{cosec} \alpha$   
 (C)  $\sec \alpha$  (D)  $-\sec \alpha$
  
4. D
  
5. If  $\sum_{r=1}^{10} r(r-1)^{10} C_r = k \cdot 2^9$ , then  $k$  is equal to  
 (A) 10 (B) 45  
 (C) 90 (D) 100
  
5. B

**(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. In the expansion of  $\left(\sqrt[3]{4} + \frac{1}{\sqrt[4]{6}}\right)^{20}$   
 (A) the number of irrational terms is 19 (B) middle term is irrational  
 (C) the number of rational terms is 2 (D) 9<sup>th</sup> term is rational
  
6. ABCD

**COMMON TEST # 9 – C-XI-11**

7. Coefficient of the middle term in the expansion of the binomial  $(1 + x)^{40}$  is equal to

(A)  $\frac{2^{20} \cdot (1 \cdot 3 \cdot 5 \dots 39)}{(20)!}$

(B) the sum of the coefficients of the two middle terms in  $(1 + x)^{39}$

(C)  $\frac{20 \cdot 21 \cdot 22 \dots 40}{(20)!}$

(D)  $\binom{20}{C_0}^2 + \binom{20}{C_1}^2 + \binom{20}{C_2}^2 + \dots + \binom{20}{C_{20}}^2$

7. **ABD**

8. Let  $(1 + x^2)^2 (1 + x)^n = A_0 + A_1x + A_2x^2 + \dots$ . If  $A_0, A_1, A_2$  are in A.P. then the value of n is

(A) 2

(B) 3

(C) 5

(D) 7

8. **AB**

9. If it is known that the third term of the binomial expansion  $(x + x^{\log_{10} x})^5$  is  $10^6$  then x is equal to

(A) 10

(B)  $10^{-5/2}$

(C) 100

(D) 5

9. **AB**

10. Which of the following must hold good(s) for the expansion of the binomial  $\left(x^4 + \frac{1}{x^3}\right)^{15}$  ?

(A) There exists a term which is independent of x.

(B) 8<sup>th</sup> and 9<sup>th</sup> terms of the expansion have the greatest binomial coefficient.

(C) Coefficients of  $x^{32}$  and  $x^{-17}$  are equal.

(D) If  $x = \sqrt{2}$  then number of rational terms in the expansion is 5.

10. **BC**

11. If  $|\cot x| = \cot x + \frac{1}{\sin x}$ , then the value of x in the interval  $[0, 3\pi]$  can be

(A)  $\frac{\pi}{3}$

(B)  $\frac{2\pi}{3}$

(C)  $\frac{4\pi}{3}$

(D)  $\frac{8\pi}{3}$

11. **BD**

12. If  $-3 + ix^2y$  and  $x^2 + y + 4i$  are conjugate of each other (where  $i = \sqrt{-1}$ ,  $x, y \in \mathbb{R}$ ), then the ordered pair  $(x, y)$  can be

(A)  $(1, -4)$

(B)  $(-1, -4)$

(C)  $(2, 1)$

(D)  $(-2, 1)$

12. **AB**

COMMON TEST # 9 – C-XI-12

13. If  $z = \frac{1+3i}{1+i}$ , then the correct statements are
- (A)  $\operatorname{Re}(z) = 2\operatorname{Im}(z)$  (B)  $\operatorname{Re}(z) + 2\operatorname{Im}(z) = 0$   
(C)  $|z| = \sqrt{5}$  (D)  $|z| = 5$
13. AC

**SECTION – C**  
**(Integer Type)**

This section contains **5 questions**. The answer to each question is a **single-digit integer**, ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled.

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1. The smallest positive integer  $n$  for which  $(1+i)^{2n} = (1-i)^{2n}$ ,  $i = \sqrt{-1}$  is
1. 2
2. The number of real solutions of  $\sin(e^x) = 5^x + 5^{-x}$  is
2. 0
3. The remainder left when  $8^{2n} - (62)^{2n+1}$  is divided by 9 is
3. 2
4. The last digit of the number  $1257^{2101}$  is
4. 7
5. The expression  $(x + \sqrt{x^3 - 1})^5 + (x - \sqrt{x^3 - 1})^5$  is a polynomial of degree
5. 7

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*Space for rough work*

# **FIITJEE COMMON TEST – IX**

BATCHES – NWCM822O1S, NWCM2022X1R, NWCM2022Y1R, NWCM2022A1R, NWCM2022A2R,  
NWCM2022A1W, NWCM2022A2W, NWCM2022A3W, NWCM2022A4W, NWCM2022X1W,  
NWCM2022Y1W, NWCM2022Z1W, NWCM2022XA1W, NWCM2022XA2W, PANINI2022-XI 1,  
PANINI2022-XI 2, & PANINI2022-G 1

## **ANSWERS KEY**

**QP Code:**

**Physics**

**SECTION – A**

**SECTION – C**

**Chemistry**

**SECTION – A**

**SECTION – C**

## **MATHEMATICS**

**SECTION – A**

**SECTION – C**