

FIITJEE - JEE (Main)

PHYSICS, CHEMISTRY & MATHEMATICS

BATCHES: NWCM123F1R_PT1

PHASE TEST – I

Q.P. CODE:

Time Allotted: 3 Hours

Maximum Marks: 300

- Do not open this Test Booklet until you are asked to do so.
- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

Important 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

- Attempt ALL the questions. Answers have to be marked on the OMR sheets.
- This question paper contains **Three Sections**.
- Section-I** is Physics, **Section-II** is Chemistry and **Section-III** is Mathematics.
- Each **Section** is further divided into **Two Parts: Part-A & C** in the OMR. Part-B of OMR to be left unused
- Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
- No candidate is allowed to carry any textual material, printed or written, bits of papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices ext. except the Admit Card inside the examination hall / room.

B. Filling of OMR Sheet:

- Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
- On the OMR sheet, darken the appropriate bubble with **Blue/Black Ball Point Pen** for each character of your Enrolment No. and write in ink your Name, Test Centre and other details at the designated places.
- OMR sheet contains alphabets, numerals & special characters for marking answers.
- Do not fold or make any stray marks on the Answer Sheet.**

C. Marking Scheme for All Two Parts:

- Part-A (01-20)** – Contains Twenty (20) multiple choice objective questions which have four (4) options each and only one correct option. Each question carries **+4 marks** which will be awarded for every correct answer and **-1 mark** will be deducted for every incorrect answer.
- 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 **+4 marks** for correct answer and **there will be no negative marking**.

Name of the Candidate : _____

Batch : _____ Date of Examination : _____

Enrolment Number : _____

Physics

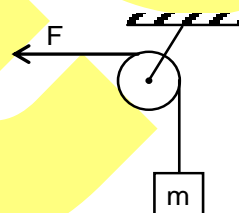
PART – A

Straight Objective Type

This part contains **20 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. A boat which has a speed of 6 km/h in still water crosses a river of width 1 km along the shortest possible path in 20 min. The velocity of the river water in km/h is
 (A) 1 (B) 3
 (C) 4 (D) $3\sqrt{3}$
1. **D**

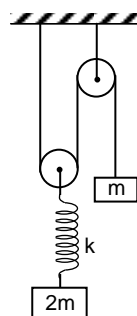
2. A block of mass m is hanging over a smooth and light pulley through a light string. The other end of the string is pulled by a constant force F . The kinetic energy of the block increase by 20 J in 1 seconds.
 (A) The work done by the tension on the block is 20 J in 1 second.
 (B) The work done by the tension on the block is greater than 20 J in one second.
 (C) The work done by the tension on the block is less than 20 J in one second.
 (D) None of the above statements are correct.



2. **B**
3. A body of mass 1kg is thrown upwards with a velocity 20m/s. It momentarily comes to rest after attaining a height of 18m. How much energy is lost due to air friction. ($g = 10 \text{ m/s}^2$)
 (A) 10J (B) 20J
 (C) 30J (D) 40J
3. **B**

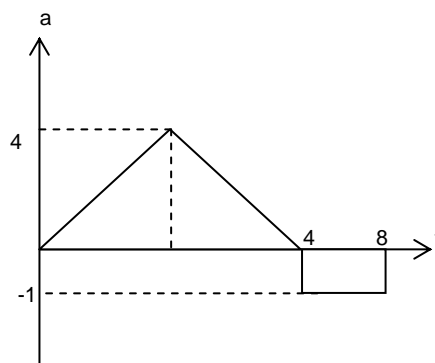
4. For a system in equilibrium as shown in figure elongation in spring will be

- (A) $\frac{mg}{k}$ (B) $\frac{2mg}{k}$
 (C) $\frac{4mg}{k}$ (D) $\frac{3mg}{k}$



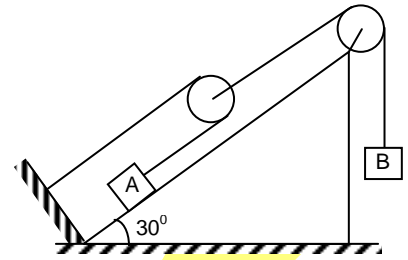
4. **B**

5. The acceleration time graph of a particle is shown in the figure. What is the velocity of particle at $t = 8\text{sec}$, if initial velocity of particle is 3m/s
 (A) 4 m/s (B) 5 m/s
 (C) 6 m/s (D) 7 m/s



5. **D**

6. In system shown in figure $m_B = 4\text{kg}$ and $m_A = 2\text{kg}$. The pulleys are massless and friction is absent everywhere. The acceleration of block A is $g = 10\text{m/s}^2$



- (A) $\frac{10}{3} \text{ m/s}^2$
- (B) $\frac{20}{3} \text{ m/s}^2$
- (C) 2 m/s^2
- (D) 4 m/s^2

6. **A**

7. Two forces, each of magnitude F have a resultant of the same magnitude F . The angle between the two forces is

- (A) 45°
- (B) 120°
- (C) 150°
- (D) 60°

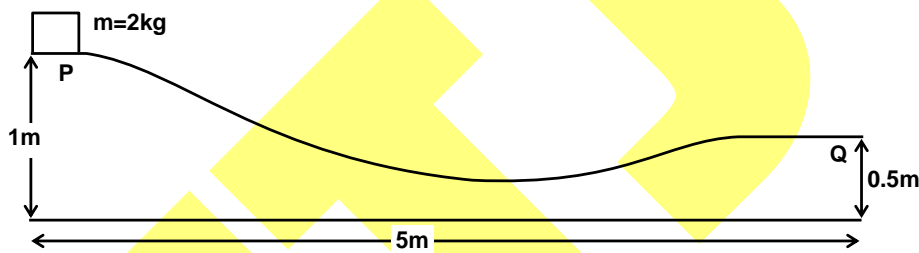
7. **B**

8. When a spring is stretched by a distance x , it exerts a force, given by $F = -5x + 16x^3 \text{ N}$. The work done, when the spring is stretched from 0.1m to 0.2m is

- (A) $8.1 \times 10^{-2} \text{ J}$
- (B) $12.2 \times 10^{-2} \text{ J}$
- (C) $8.1 \times 10^{-1} \text{ J}$
- (D) $12.2 \times 10^{-1} \text{ J}$

8. **A**

9. Find the horizontal velocity of the particle when it reach the point Q. Assume there is no friction. Take $g = 9.8 \text{ m/s}^2$.

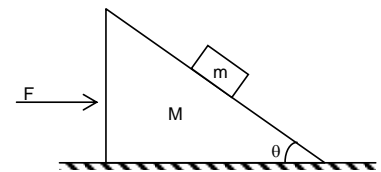


- (A) 4 m/s
- (B) 5 m/s
- (C) 3.13 m/s
- (D) 3.6 m/s

9. **C**

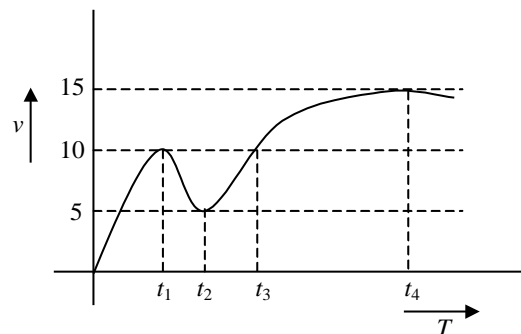
10. All surfaces are smooth, then calculate the value of F for which the block remains stationary w.r.t wedge.

- (A) $Mg \tan \theta$
- (B) $(M+m)g \tan \theta$
- (C) $Mg \cot \theta$
- (D) $(M+m)g \cot \theta$



10. **B**

11. Velocity time graph of a particle undergoing rectilinear motion is plotted upto $T = t_4$ as shown in the figure. Average acceleration of the particle is zero in the time interval between



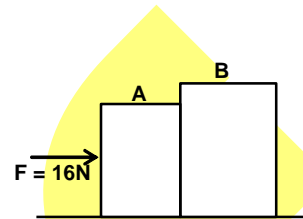
- (A) 0 and t_1
- (B) t_1 and t_2
- (C) t_1 and t_3
- (D) t_2 and t_4

11. **C**

12. If a unit vector is represented by $0.5\hat{i} + 0.8\hat{j} + c\hat{k}$, then the value of 'c' is
 (A) 1 (B) $\sqrt{0.11}$
 (C) $\sqrt{0.01}$ (D) $\sqrt{0.39}$

12. **B**

13. Two blocks A and B of masses 4kg and 12 kg are placed on a smooth horizontal plane, a force F of 16N is applied on A, as shown, then the contact force between the blocks is
 (A) 4N (B) 8N
 (C) 12N (D) 16N

13. **C**

14. A person walking at the rate of 3km/hour, the rain appears to fall vertically when he increase his to speed 6 km/hr it appears to meet him at angle of 45° with vertical. The speed of rain is
 (A) $3\sqrt{2}$ km/hr (B) $\frac{3}{\sqrt{2}}$ km/hr
 (C) $6\sqrt{2}$ km/hr (D) $2\sqrt{3}$ km/hr

14. **A**

15. The unit vector perpendicular to $\vec{i} - 2\vec{j} + \vec{k}$ and $3\vec{i} + \vec{j} - 2\vec{k}$ is
 (A) $\frac{5\vec{i} + 3\vec{j} + 7\vec{k}}{\sqrt{83}}$ (B) $\frac{3\vec{i} + 5\vec{j} + 7\vec{k}}{\sqrt{83}}$
 (C) $\frac{5\vec{i} + 3\vec{j} - 7\vec{k}}{\sqrt{83}}$ (D) $\frac{3\vec{i} - 5\vec{j} + 7\vec{k}}{\sqrt{83}}$

15. **B**

16. A projectile is projected at an angle $\alpha (>45^\circ)$ with an initial velocity u (t=0). The time t at which its horizontal velocity will equal to the vertical velocity
 (A) $t = \frac{u}{g}(\cos \alpha - \sin \alpha)$ (B) $t = \frac{u}{g}(\cos \alpha)$
 (C) $t = \frac{u}{g}(\sin \alpha - \cos \alpha)$ (D) $t = \frac{u}{g}(\sin^2 \alpha - \cos^2 \alpha)$

16. **C**

17. An object of mass m is hanging by a string from the ceiling of an elevator. The elevator is moving upward but slowing down. What is the tension in the sting
 (A) less than mg (B) exactly mg
 (C) greater than mg (D) zero

17. **A**

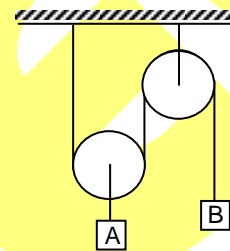
18. Power applied to a particle varies with time as $P = (3t^2 - 2t + 1)$ watt, where t is in second. Find the change in its kinetic energy between t = 2sec and t = 4sec
 (A) 32J (B) 46J
 (C) 61J (D) 100J

18. **B**

19. If $\vec{A} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{B} = -\hat{i} + 3\hat{j} + 4\hat{k}$, then projection of \vec{A} on \vec{B} will be
- (A) $\frac{3}{\sqrt{13}}$ (B) $\frac{3}{\sqrt{26}}$
 (C) $\sqrt{\frac{3}{26}}$ (D) $\sqrt{\frac{3}{13}}$
19. **B**
20. In projectile motion power of the gravitational force
- (A) is constant throughout (B) is -ve through out
 (C) varies linearly with time (D) is positive for complete path
20. **C**

PART-B
Numerical Type

1. As shown in figure two blocks A and B are connected by pulleys through strings as shown in figure. If block A is moved 2 cm down wards then find the magnitude of the displacement of block B (in cm).

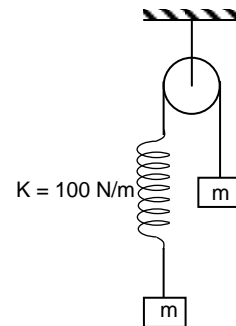


1. **4**

2. An object is displaced from point A(1m, 2m, 3m) to a point B(2m, 3m, 4m) under a constant force $\vec{F} = (2\hat{i} + 3\hat{j} + 4\hat{k})\text{N}$. Find the work done by this force in this process. (in joule)

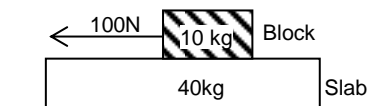
2. **9**

3. A system of two block is in equilibrium as shown in figure if spring constant $k = 100 \text{ N/m}$ & mass of block is $m = 20 \text{ kg}$. Find out elongation in spring. (Take $g = 10 \text{ m/s}^2$)



3. **2**

4. A 40 kg slab rests on a frictionless floor. A 10kg block rests on top of the slab. The static coefficient of friction between the block and the slab is 0.70 while the kinetic coefficient is 0.50. The 10 kg block is acted upon by a horizontal force of 100N, the resulting acceleration of the slab will be



4. **1.25**

5. A body starts from rest with constant acceleration, what is the ratio of the distance traveled by the body during the 4th and 3rd second?

5. **1.4**

Chemistry

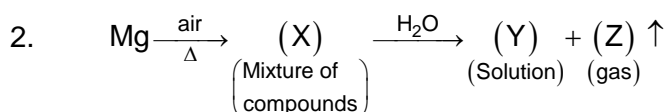
PART – A

Straight Objective Type

This part contains **20 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. A one litre vessel contains 4 g each of H₂ and helium gases at 300 K. How much pressure is exerted by the gases in the vessel?
 (A) 600 R (B) 1200 R
 (C) 2400 R (D) 900 R

1. D



The gas 'Z' in the above reaction is:

- (A) NH₃ (B) N₂
 (C) O₂ (D) H₂

2. A

3. What is the atomic mass of nascent hydrogen in g mol⁻¹ unit?
 (A) 1.5 (B) 1
 (C) 0.5 (D) 2

3. B

4. If the radius of the first orbit of hydrogen atom is a₀, what will be the radius of second orbit of He⁺ ion?
 (A) 2a₀ (B) 4a₀
 (C) a₀/2 (D) a₀/4

4. A

5. Which of the following atom has the highest value of first ionization energy?
 (A) C (2s²2p²) (B) N (2s²2p³)
 (C) O (2s²2p⁴) (D) Si (3s²3p²)

5. B

6. Which of the following statement is correct regarding the molecule PCI₃F₂?
 (A) 'F' atoms are present at the equatorial position of the Trigonal bipyramidal geometry.
 (B) 'Cl' atoms are present at the axial positions
 (C) The dipole moment of the molecule is zero
 (D) All are correct

6. C

7. What is the oxidation number of chromium in Na₂Cr₂O₇?
 (A) +3 (B) +6
 (C) +12 (D) +2

7. B

8. Which of the following molecule of the ideal gases diffuses at the fastest rate under identical conditions?
(A) N_2 (B) CO
(C) C_2H_4 (D) All the molecules effuse at the same rate
8. D
9. Which of the following substance is most susceptible to decomposition reaction?
(A) H_2O (B) D_2O
(C) H_2O_2 (D) HDO
9. C
10. How many electron(s) is/are present in the valence shell of the atom which has maximum value of electron gain enthalpy in the periodic table?
(A) 3 (B) 6
(C) 7 (D) 5
10. C
11. How many unpaired electron(s) is/are present in KO_2 ?
(A) 1 (B) 2
(C) zero (D) unpredictable
11. A
12. 200 mL of 0.2 M NaOH solution can be completely neutralized by
(A) 100 mL of 0.1 M H_2SO_4 (B) 100 mL of 0.4 M HCl
(C) 200 mL of 0.1 M HNO_3 (D) 200 mL of 0.2 M KOH
12. B
13. Which of the following has the least value of 'a' (vander Waal's constant)?
(A) SO_2 (B) N_2
(C) CO (D) He
13. D
14. Which of the following carbonate can be easily decomposed?
(A) $BeCO_3$ (B) Na_2CO_3
(C) $MgCO_3$ (D) $CaCO_3$
14. A
15. How many electrons of an atom of phosphorus has/have $\ell = 1$?
 ℓ = Azimuthal quantum number
(A) 8 (B) 3
(C) 6 (D) 9
15. D
16. The element having the highest value of electronegativity is present in the
(A) second period (B) third period
(C) Gr – 16 (D) Gr – 15
16. A

17. $\text{MnO}_4^- + \text{SO}_3^{2-} + \text{H}^+ \longrightarrow \text{Mn}^{2+} + \text{SO}_4^{2-} + \text{H}_2\text{O}$
 What will be the stoichiometric coefficient of H^+ if the above equation is balanced in acidic medium?
 (A) 4 (B) 6
 (C) 3 (D) 5
17. **B**
18. Which of the following particle will have the longest de-Broglie wavelength if they move with the same velocity?
 (A) Proton (B) Electron
 (C) Neutron (D) α - particle
18. **B**
19. An electron absorbs a photon of wavelength λ_1 and got excited. From the excited state it emits two photons of wavelengths λ_2 and λ_3 . The relation between the different wavelengths is:
 (A) $\lambda_1 = \lambda_2 + \lambda_3$ (B) $\frac{1}{\lambda_1} = \frac{1}{\lambda_2} + \frac{1}{\lambda_3}$
 (C) $\lambda_1 = \lambda_2 \times \lambda_3$ (D) $\frac{1}{\lambda_1} = \frac{1}{\lambda_2} \times \frac{1}{\lambda_3}$
19. **B**
20. Which of the following gas(es) is/are evolved on thermal decomposition of lithium nitrate?
 (A) O_2 (B) NO
 (C) NO_2 and O_2 (D) NO and O_2
20. **C**

PART-B
Numerical Type

1. What is the atomic number of the polyelectron atom which is the smallest atom of its group as well as period?
 1. 9
2. How many lone pair of electron(s) is/are present on oxygen atom in water?
 2. 2
3. A vessel contains 600 mL of 0.4 M solution of NaOH. On heating, 560 mL of water was evaporated. What is the molarity of the remaining solution?
 3. 6
4. If the ratio of relative rate of effusion of SO_2 and CH_4 gases from two containers containing equal number of moles, is expressed as $x : y$, the value of $x + y$ is
 4. 3
5. How many gram of AgCl is formed by complete reaction of 0.1 mole of Ag and 0.1 mole of Cl_2 ?
 [At. mass of Ag = 108, Cl = 35.5]
 5. 14.35

Mathematics

PART – A

Straight Objective Type

This part contains **20 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. The Equation of line making an angle θ with x-axis and y-intercept=7, where $\sin\theta = \frac{5}{13}$ is

(A) $12x - 17y = 15$	(B) $5x - 12y + 84 = 0$
(C) $2x + 17y = 15$	(D) $2x - 17y = 15$

1. B

2. Angle between the lines $x - 2y + 1 = 0$ and $x + 3y + 4 = 0$ is

(A) $\frac{\pi}{6}$	(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{3}$	(D) None

2. B

3. If $y = 2x$ is one of the line $ax^2 + 2xy + y^2 = 0$ then 'a' equal to

(A) - 8	(B) - 4
(C) - 2	(D) None

3. A

4. If $(-1, 1)$ and $(-2, 2)$ lies on opposite side of line $2x + y + a = 0$ then range of a is

(A) $(-2, 2)$	(B) $(-1, 1)$
(C) $(0, 1)$	(D) $(1, 2)$

4. D

5. The radius of the circle passing through the point $P(6, 2)$ two of whose diameters are $x + y = 6$ and $x + 2y = 4$ is

(A) 10	(B) $2\sqrt{5}$
(C) 6	(D) 4

5. B

6. Slope of tangent to $x^2 + y^2 + 2x + 4y - 15 = 0$ at $(1, 2)$ is

(A) -1	(B) $-\frac{1}{2}$
(C) $-\frac{1}{4}$	(D) None

6. B

7. If $y = (1+x^{1/4})(1+x^{1/2})(1-x^{1/4})$ then $\frac{dy}{dx} =$
 (A) 1 (B) -1
 (C) x (D) \sqrt{x}
7. B
8. $\int \frac{\sin^2 x}{1+\cos x} dx =$
 (A) $x + \sin x + c$ (B) $x - \sin x + c$
 (C) $-x + \sin x + c$ (D) $2x - \sin x + c$
8. B
9. Orthocentre of the triangle whose circumcentre and centroid are (0, 0) and (1, 1) is
 (A) (3, 3) (B) (2, 2)
 (C) $\left(\frac{3}{2}, \frac{3}{2}\right)$ (D) none of these
9. A
10. The value of $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ$ is
 (A) $\frac{1}{36}$ (B) $\frac{1}{32}$
 (C) $\frac{1}{18}$ (D) $\frac{1}{16}$
10. D
11. If $\tan(\alpha + \beta) = \frac{5}{12}$ and $\cot(\alpha - \beta) = \frac{4}{3}$, then $\tan 2\beta$ is equal to
 (A) $-\frac{16}{63}$ (B) $\frac{12}{35}$
 (C) $-\frac{9}{28}$ (D) none of these
11. A
12. If $\sin(\theta + 28^\circ) = \cos(3\theta - 75^\circ)$ then the value of acute θ are
 (A) 46° or 7° (B) 36° or 9°
 (C) 35° or 8° (D) none of these
12. C
13. If $\sin 2\theta(4\cos^2\theta - 3)(3 - 4\sin^2\theta) = \frac{1}{\sqrt{2}}$ then least positive value of θ is equal to
 (A) $\frac{\pi}{4}$ (B) $\frac{\pi}{12}$
 (C) $\frac{\pi}{24}$ (D) None
13. C

14. $\cos\left(\frac{\pi}{15}\right) \cdot \cos\left(\frac{2\pi}{15}\right) \cdot \cos\left(\frac{4\pi}{15}\right) \cdot \cos\left(\frac{8\pi}{15}\right)$ is
- (A) $\frac{1}{8}$ (B) $\frac{1}{4}$
(C) $\frac{1}{16}$ (D) $\frac{-1}{16}$
14. D
15. If S is the director circle of S_1 and S_1 is director circle of $x^2 + y^2 = 8$ then radius of S is
- (A) 4 (B) $4\sqrt{2}$
(C) 8 (D) None
15. B
16. The number of solutions of $\log(2x) = 2\log(4x - 15)$ is
- (A) 1 (B) 2
(C) 3 (D) infinite
16. A
17. The total number of real solution of $x^2 + 5|x| + 6 = 0$ will be
- (A) 4 (B) 2
(C) 1 (D) 0
17. D
18. The value of x for which $\frac{1}{3-x} > 1$
- (A) $(-\infty, -3)$ (B) $(2, \infty)$
(C) $(2, 3)$ (D) None of these
18. C
19. If the line $y = mx$ meets the lines $x + 2y - 1 = 0$ and $2x - y + 3 = 0$ at the same point, then m is equal to
- (A) 1 (B) -1
(C) 2 (D) -2
19. B
20. If $A + B + C = 180^\circ$, then the value of $\cot\frac{A}{2} + \cot\frac{B}{2} + \cot\frac{C}{2}$ will be
- (A) $2\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}$ (B) $4\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}$
(C) $\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}$ (D) $8\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2}$
20. C

PART-B
Numerical Type

1. Chord AB of the circle $x^2 + y^2 = 100$ passes through the point (7, 1) and subtends an angle of 60° at the circumference of the circle. If m_1 and m_2 are the slopes of two such chords then the value of $m_1 m_2$ is
 1. - 1
2. If $y = (1 + 4x^2)(3 - 2x^3)$ then $\frac{dy}{dx}$ at $x = 1$ is
 2. - 22
3. If $\operatorname{cosec} \theta - \cot \theta = \frac{1}{3}$ then $\cos \theta$ is
 3. 0.8
4. Area of triangle formed by (1,2), (3,4) and (5,8) is
 4. 2
5. If $\sin(A - B) = \frac{1}{\sqrt{10}}$, $\cos(A + B) = \frac{2}{\sqrt{29}}$ then $\tan 2A$ equal to $\left(0 < A, B < \frac{\pi}{4}\right)$
 5. 17

Space For Rough Work

FIITJEE INTERNAL TEST

BATCHES: NWCM123E1R+E1W_PT1

PHYSICS, CHEMISTRY & MATHEMATICS

JEE MAIN-PHASE-I

Paper Code

ANSWER KEY

SECTION – I

(PHYSICS)

PART – A

PART – B

JEEM

(CHEMISTRY)

PART – A

PART – B

SECTION – III
(MATHEMATICS)

PART – A

PART – B