

FIITJEE - JEE (Main)

PHYSICS, CHEMISTRY & MATHEMATICS

BATCH: PANINI426-C1

PHASE TEST – I

Q.P. CODE: 100748

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

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. This question paper contains **Three Sections**.
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 & B** in the OMR.
5. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
6. 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.

**Forthcoming
Exam – FTRE on
15th Sept. 2024.**

B. Filling of OMR Sheet:

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.

*** In multiple choice questions the options are given as F,T,R & E which correspond to the options A,B,C & D respectively in the OMR sheet.**

2. 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.
3. OMR sheet contains alphabets, numerals & special characters for marking answers.
4. **Do not fold or make any stray marks on the Answer Sheet.**

C. Marking Scheme for All Two Parts:

- (i) **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.
- (ii) **Part-B (01-05)** contains five (05) Numerical based questions, the answer of which maybe positive or negative numbers or decimals **Two decimal Places** (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 : _____

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Physics

PART – A

Straight Objective Type

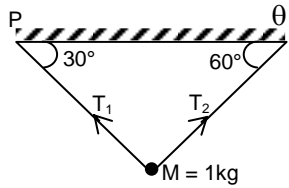
This part contains **20 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

- If $\vec{A} + \vec{B}$ is a unit vector along x-axis and $\vec{A} = \hat{i} - \hat{j} + \hat{k}$, then what is \vec{B}

(F) $\hat{i} - \hat{k}$ (T) $\hat{j} - \hat{k}$ (R) $\hat{i} + \hat{j} + \hat{k}$ (E) $\hat{i} + \hat{j} - \hat{k}$
- If force F, length L and time T are taken as fundamental units, the dimensional formula for mass will be

(F) $[FL^{-1}T^2]$ (T) $[FLT^{-2}]$
 (R) $[FL^{-1}T^{-1}]$ (E) $[FL^5T^2]$
- A 1 kg ball hangs in equilibrium from two strings as shown in the figure. Calculate the tension T_1 and T_2 in the strings (take $g = 10 \text{ m/s}^2$)

(F) 5N, 5N (T) $5\sqrt{3}\text{N}, 5\sqrt{3}\text{N}$
 (R) 5N, $5\sqrt{3}\text{N}$ (E) $5\sqrt{3}\text{N}, 5\text{N}$


- If a unit vector is represented by $0.5\hat{i} + 0.8\hat{j} + c\hat{k}$, then the value of 'c' is

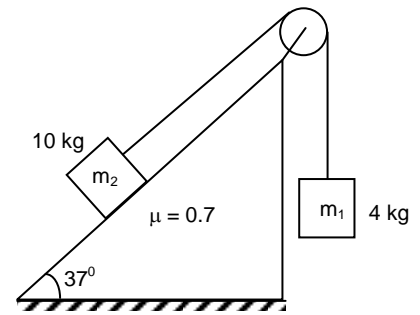
(F) 1 (T) $\sqrt{0.11}$ (R) $\sqrt{0.01}$ (E) $\sqrt{0.39}$
- Which one of the following has the dimensions of pressure?

(F) $[ML^{-2}T^{-2}]$ (T) $[M^{-1}L^{-1}]$
 (R) $[MLT^{-2}]$ (E) $[ML^{-1}T^{-2}]$
- If $\vec{R}_1 = \vec{A} + \vec{B}$ and $\vec{R}_2 = \vec{A} - \vec{B}$, then $\frac{\vec{R}_1 + \vec{R}_2}{|\vec{R}_1 + \vec{R}_2|}$ will be along

(F) \vec{A} (T) \vec{B}
 (R) $\vec{A} + \vec{B}$ (E) $\vec{A} - \vec{B}$

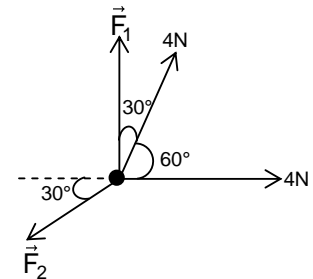
Space For Rough Work

7. For the arrangement shown in figure, net contact force applied by incline plane on block of mass m_2 will be
 (F) 80N (T) $20\sqrt{17}$ N
 (R) 20N (E) 100N



8. Two forces, each of magnitude. F have a resultant of the same magnitude F. The angle between the two forces is
 (F) 45° (T) 120°
 (R) 150° (E) 60°
9. 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
 (F) 1 (T) 3
 (R) 4 (E) $3\sqrt{3}$
10. Dimensions of linear impulse are
 (F) $[ML^{-2}T^{-3}]$ (T) $[ML^{-2}]$
 (R) $[MLT^{-1}]$ (E) $[MLT^{-2}]$
11. A particle moves in the X-Y plane under the influence of a force such that its linear momentum is $\vec{p}(t) = A[\hat{i} \cos(kt) - \hat{j} \sin(kt)]$, where A and k are constants. The angle between the force and the momentum is
 (F) 0° (T) 30°
 (R) 45° (E) 90°

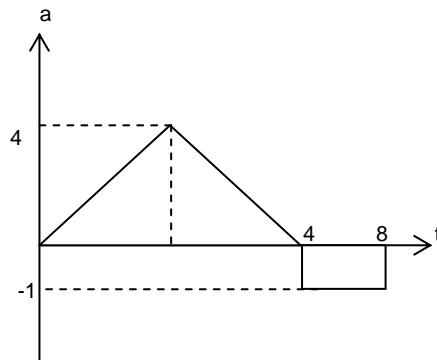
12. An object is in equilibrium under four concurrent forces in the direction shown in figure. the magnitude of \vec{F}_1 and \vec{F}_2 are
 (F) $0N, 4\sqrt{3}N$ (T) $4\sqrt{3}N, 0N$
 (R) $4\sqrt{3}N, 4\sqrt{3}N$ (E) $0, N, 0N$



Space For Rough Work

13. If error in measurement of radius of a sphere is 1%, what will be the error in measurement of volume?
 (F) 1% (T) $\frac{1}{3}\%$
 (R) 3% (E) 10%

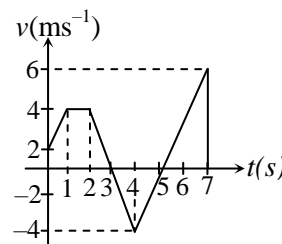
14. The acceleration time graph of a particle is shown in the figure. What is the velocity of particle at $t = 8\text{sec}$, if initial velocity of particle is 3m/s
 (F) 4 m/s (T) 5 m/s
 (R) 6 m/s (E) 7 m/s



15. A particle has an initial velocity of $3\hat{i} + 4\hat{j}$ and an acceleration of $0.4\hat{i} + 0.3\hat{j}$. Its Speed after 10 sec is
 (F) 10 m/s (T) 7 m/s (R) $7\sqrt{2}\text{ m/s}$ (E) 8.5 m/s

16. A particle moves along the curve $y = \frac{x^2}{2}$. Here x varies with time as $x = \frac{t^2}{2}$. Where x and y are measured in metre and t in second. At $t = 2\text{sec}$. the velocity of the particle (in ms^{-1}) is
 (F) $2\hat{i} - 4\hat{j}$ (T) $2\hat{i} + 4\hat{j}$ (R) $4\hat{i} + 2\hat{j}$ (E) $4\hat{i} - 2\hat{j}$

17. The velocity-time curve of a body is shown in figure. The average speed of the body in first seven second is
 (F) 1 ms^{-1} (T) 2 ms^{-1}
 (R) $\frac{11}{7}\text{ ms}^{-1}$ (E) $\frac{19}{7}\text{ ms}^{-1}$



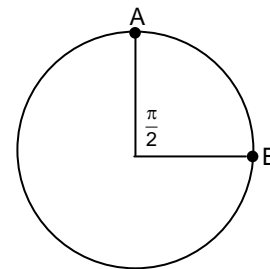
18. Vernier constant is the
 (F) value of one MSD divided by total number of divisions on the main scale
 (T) value of one VSD divided by total number of divisions on the vernier scale
 (R) total number of divisions on the main scale divided by total number of divisions on the vernier scale
 (E) difference between value of one main scale division and one vernier scale division

Space For Rough Work

19. If \vec{A} and \vec{B} are two mutually perpendicular vectors, where $\vec{A} = 5\vec{i} + 7\vec{j} + 3\vec{k}$ and $\vec{B} = 2\vec{i} + 2\vec{j} - a\vec{k}$, then the value of a is
 (F) -2 (T) 8
 (R) -7 (E) -8
20. For any two vectors \vec{A} and \vec{B} if $\vec{A} \cdot \vec{B} = |\vec{A} \times \vec{B}|$, the magnitude of $\vec{C} = \vec{A} + \vec{B}$ is equal to
 (F) $\sqrt{A^2 + B^2}$ (T) $A + B$
 (R) $[A^2 + B^2 + \left[A^2 + B^2 + \frac{AB}{\sqrt{2}}\right]^{1/2}]^{1/2}$ (E) $(A^2 + B^2 + \sqrt{2} \times AB)^{1/2}$

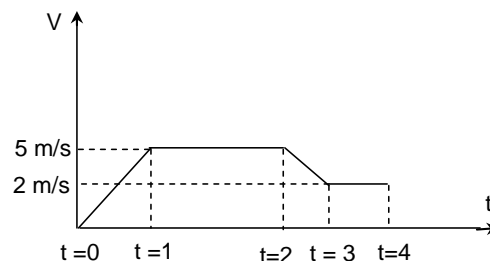
PART-B
Numerical Type

1. A particle is moving in a circular path of radius 1 metre. Under the action of centripetal force. The speed $\frac{\pi}{\sqrt{2}}$ m/s of the particle is constant. Find the average velocity(in m/s) between A and B.



2. At what angle θ_0 is $\left(\frac{2\pi}{5n}\right)$ should a shell be fired if at the top of its trajectory its path has a radius of curvature equal to twice the maximum height of the trajectory. Then 'n' is
3. Vector \vec{A} is gives as function of time as $\vec{A} = 10\vec{i} - 2t\vec{j}$ and \vec{B} as $\vec{B} = 5\vec{i} + 5\vec{j}$
 Find the time when \vec{A} is perpendicular to \vec{B}

4. What will be distance travelled by a particle from $t = 0$ to $t = 4$ sec.



5. 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 (km/hr) ($\sqrt{2} = 1.41$)

Space For Rough Work

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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.

- How many moles of electrons are present in 18 g H₂O?
(F) 1 (T) 18
(R) 10 (E) 5
- The radius of the first energy shell of H-atom is 0.53 Å. What will be the radius of its fourth energy shell?
(F) 2.12 Å (T) 8.48 Å
(R) 3.18 Å (E) 1.06 Å
- Which has the largest ionic radius?
(F) Cl⁻ (T) K⁺
(R) Ca²⁺ (E) S²⁻
- 2SO₂ + O₂ → 2SO₃
The equivalent mass of O₂ in above reaction in g equ⁻¹ unit is
(F) 4 (T) 16
(R) 8 (E) 32
- Which of the following needs the maximum number of different quantum numbers for its representation?
(F) p-subshell (T) 3p_z orbital
(R) third orbit or energy shell (E) 2p_x¹ configuration
- Which of the following order is correct for the first ionization energies of Na, Mg, Al and Si?
(F) Na > Al > Mg > Si (T) Si > Al > Mg > Na
(R) Si > Mg > Al > Na (E) Na > Mg > Al > Si

Space For Rough Work

7. $\text{MnO}_4^- + \text{H}^+ + \text{Fe}^{2+} \longrightarrow \text{Mn}^{2+} + \text{Fe}^{3+} + \text{H}_2\text{O}$
 Balance the equation and state the moles of Fe^{2+} that can be oxidized by one mole of MnO_4^- ?
 (F) 1.5 (T) 5
 (R) 0.2 (E) 2.5
8. Which of the following electronic transition in hydrogen spectrum emits a visible radiation?
 (F) $n_2 = 5 \rightarrow n_1 = 4$ (T) $n_2 = 3 \rightarrow n_1 = 2$
 (R) $n_2 = 4 \rightarrow n_1 = 3$ (E) $n_2 = 3 \rightarrow n_1 = 1$
9. The first ionization energy(I.E₁) and electron affinity(EA) of an atom are respectively x and -y kJ mol⁻¹. Then the electronegativity of the atom in Mulliken scale is
 (F) $\frac{x-y}{2}$ (T) $\frac{x+y}{2}$
 (R) $x + \frac{y}{2}$ (E) $\frac{x}{2} + y$
10. Which of the following electron transition in hydrogen atom emits radiation of largest wavelength?
 (F) $n = 3 \rightarrow n = 1$ (T) $n = 4 \rightarrow n = 3$
 (R) $n = 4 \rightarrow n = 1$ (E) $n = 3 \rightarrow n = 2$
11. What is the oxidation number of carbon in CH_2Cl_2 ?
 (F) +2 (T) -2
 (R) zero (E) +1
12. What is the equivalent mass of H_3PO_4 in the following reaction?
 $2\text{NaOH} + \text{H}_3\text{PO}_4 \longrightarrow \text{Na}_2\text{HPO}_4 + 2\text{H}_2\text{O}$ [Molar mass of $\text{H}_3\text{PO}_4 = M$ g]
 (F) $\frac{M}{4}$ (T) $\frac{M}{2}$
 (R) $\frac{M}{6}$ (E) M
13. The largest difference in ionic radii is observed between?
 (F) O^{2-} and F^- ions (T) Na^+ and C^{4-} ions
 (R) Al^{3+} and C^{4-} ions (E) N^{3-} and O^{2-} ions
14. If the first ionization energy of helium is x eV, how much energy is needed to ionize a helium gaseous atom completely to its positive ion?
 (F) $(x + 54.4)$ eV (T) $(2x + 54.4)$ eV
 (R) $(x + 13.6)$ eV (E) $(2x + 13.6)$ eV

Space For Rough Work

15. What is the set of quantum numbers for the valence electron of sodium?
(F) (2, 1, -1, $\pm\frac{1}{2}$) (T) (3, 1, 0, $\pm\frac{1}{2}$)
(R) (3, 0, 0, $\pm\frac{1}{2}$) (E) (3, 0, 1, $\pm\frac{1}{2}$)
16. The weight of each pellet of NaOH is 2g. How many pellets are required to neutralize 200 mL of 5 M aqueous solution of HCl completely?
(F) 12 (T) 15 (R) 10 (E) 20
17. $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \longrightarrow \text{Mn}^{2+} + \text{CO}_2 + \text{H}_2\text{O}$
What will be the stoichiometric coefficient of CO_2 if the above reaction is balanced in acidic medium?
(F) 8 (T) 10 (R) 6 (E) 12
18. Which of the following atom has a half-filled electronic configuration?
(F) Beryllium (T) Carbon (R) Nitrogen (E) Oxygen
19. Which quantum number has positive, zero as well as negative values?
(F) Principal quantum number (T) Azimuthal quantum number
(R) Magnetic quantum number (E) Spin quantum number
20. The mass percentage of oxygen present in calcium carbonate (CaCO_3) is
(F) 24% (T) 48% (R) 36% (E) 60%

PART-B
Numerical Type

1. 5 mole of a mixture of $\text{Na}_2\text{C}_2\text{O}_4$ and Na_2CO_3 required 400 mL of 0.5 M acidified KMnO_4 for complete oxidation. What is the mole fraction of $\text{Na}_2\text{C}_2\text{O}_4$ in the mixture?
2. How many electrons of calcium atom have $\ell = 0$?
[ℓ = azimuthal quantum number]
3. The successive ionization energies of a s-block element are 8.6, 12.9, 1630.2, 2406.2 eV, etc
If atomic mass of the elements is 39.8 g mol^{-1} , what will be the molar mass of its normal oxide?
4. $2\text{Na}_2\text{S}_2\text{O}_3 + \text{I}_2 \longrightarrow \text{Na}_2\text{S}_4\text{O}_6 + 2\text{NaI}$
How many equivalent of I_2 can completely react with 200 mL of 0.5 N sodium thiosulphate solution?
5. The ionization energy of hydrogen atom is 13.6 eV. If a hydrogen atom is supplied 14.8 eV energy, the electron of it moves with kinetic energy of $y \times 10^{-19} \text{ J}$. What is 'y'? [1 eV = $1.6 \times 10^{-19} \text{ J}$]

Space For Rough Work

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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.

- The set of all real numbers x for which $x^2 - |x + 2| + x > 0$, is
 (F) $(-\infty, -2) \cup (2, \infty)$ (T) $(-\infty, -1) \cup (1, \infty)$
 (R) $(-\infty, -\sqrt{2}) \cup (\sqrt{2}, \infty)$ (E) $(\sqrt{2}, \infty)$
- Value of $\log_3 2 \log_4 3 \cdot \log_5 4 \cdot \log_6 5 \cdot \log_7 6 \cdot \log_8 7$
 (F) $\frac{1}{2}$ (T) $\frac{1}{4}$
 (R) $\frac{1}{3}$ (E) $\frac{1}{5}$
- If $\tan 20^\circ = k$ then $\frac{\tan 250^\circ + \tan 340^\circ}{\tan 200^\circ - \tan 110^\circ}$ is equal to
 (F) $\frac{1-k^2}{1+k^2}$ (T) $\frac{1+k^2}{1-k^2}$
 (R) $\frac{2k}{1-k^2}$ (E) $\frac{2k}{1+k^2}$
- The value of x in the equation $25^{\log_{10} x} = 5 + 4x^{\log_{10} 5}$ is,
 (F) 10 (T) 100
 (R) 5 (E) None of these
- If $|3x - 2| + 4 = k$ has 2 distinct solutions, then k is
 (F) 3 (T) 4
 (R) 6 (E) 0

Space For Rough Work

6. $\frac{7^{\log_{49} 5} - \sqrt{5}}{2^{\log_4 2} + \sqrt{2}} =$
 (F) 0 (T) 1
 (R) $\sqrt{2}$ (E) $\sqrt{5}$
7. $\int \frac{e^{x-1} + x^{e-1}}{e^x + x^e} dx = h(x)$, then $h(x)$ equals to
 (F) $\log(e^x + x^e) + c$ (T) $\frac{1}{e} \log(e^x + x^e) + c$
 (R) $-\frac{1}{e} \log(e^x + x^e) + c$ (E) none of these
8. Value of $\cos \frac{\pi}{7} \cos \frac{2\pi}{7} \cos \frac{4\pi}{7}$ be
 (F) $\frac{1}{8}$ (T) $\frac{-1}{16}$
 (R) $\frac{1}{16}$ (E) $\frac{-1}{8}$
9. The minimum value of $f(x) = \sin^4 x + 4 \cos^2 x + 1$
 (F) 1 (T) 2
 (R) 5 (E) None of these
10. If the expression, $2 \cos 10^\circ + \sin 100^\circ + \sin 1000^\circ + \sin 10000^\circ$ is simplified, then it simplifies to
 (F) $\cos 10^\circ$ (T) $3 \cos 10^\circ$
 (R) $4 \cos 10^\circ$ (E) $5 \cos 10^\circ$
11. The value of $\cos(-89^\circ) + \cos(-87^\circ) + \cos(-85^\circ) + \dots + \cos(87^\circ) + \cos(89^\circ)$ is equal to
 (F) $\operatorname{cosec} 1^\circ$ (T) $\sec 1^\circ$
 (R) $2 \sec 1^\circ$ (E) $2 \operatorname{cosec} 1^\circ$
12. If $x = 2 \ln \cot t$ and $y = \tan t + \cot t$, the value of $\frac{dy}{dx}$ is
 (F) $\cot 2t$ (T) $\tan 2t$
 (R) $\cos 2t$ (E) $\sec 2t$

Space For Rough Work

13. If $\tan 20^\circ = p$, then $\frac{\tan 160^\circ - \tan 110^\circ}{1 + \tan 160^\circ \tan 110^\circ} =$
- (F) $\frac{2p}{1+p^2}$ (T) $\frac{1-p^2}{2p}$
 (R) $\frac{1-p^2}{1+p^2}$ (E) $\frac{2p}{1-p^2}$
14. If $x = a(t - \sin t)$, $y = a(1 - \cos t)$, then $\frac{dy}{dx}$ is equal to
- (F) $\frac{\sin t}{1 + \cos t}$ (T) $\frac{1 + \cos t}{\sin t}$
 (R) $\frac{\cos t}{1 - \sin t}$ (E) $\frac{\cos t}{1 + \sin t}$
15. $\int \frac{dx}{x+1} =$
- (F) $\ln|x+1| + c$ (T) $\ln|x| + c$
 (R) $\ln|x-1| + c$ (E) None of these
16. $\lim_{x \rightarrow 0} \frac{\sin(-x)}{x}$
- (F) 0 (T) 1
 (R) -1 (E) does not exist
17. $\frac{\sin \alpha \sin 3\alpha + \sin 3\alpha \sin 7\alpha + \sin 5\alpha \sin 15\alpha}{\sin \alpha \cos 3\alpha + \sin 3\alpha \cos 7\alpha + \sin 5\alpha \cos 15\alpha} =$
- (F) $\sin 11\alpha$ (T) $\cos 11\alpha$
 (R) $\tan 11\alpha$ (E) $\cot 11\alpha$
18. If $x^{\log_3 4} = 27$, then the value of $x^{(\log_3 4)^2}$ is
- (F) 16 (T) 64
 (R) 81 (E) 4
19. If $\log_{12} 27 = a$, then $\log_6 16$ is
- (F) $3 \left(\frac{3+a}{3-a} \right)$ (T) $\frac{3-2a}{3+4a}$
 (R) $\frac{2a+3}{4a-3}$ (E) $\frac{4(3-a)}{(3+a)}$

Space For Rough Work

20. The number of solutions of $\log_4(x-1) = \log_2(x-3)$ is
 (F) 0 (T) 1
 (R) 2 (E) 3

PART-B
Numerical Type

1. Number of integral values of x satisfying $\frac{x^2 - 7|x| + 10}{x^2 - 6x + 9} < 0$ is
2. Find the value of $n(P(P(P(\phi)))) = ?$
 (Where $P(A)$ denotes the power set of 'A' and $n(A)$ represents number of elements in set 'A')
3. A college awarded 38 medals in Football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 players and only three players got medals in all three sports; then how many players received medals in exactly two of the three sports?
4. Number of integral values of 'x' satisfying the given inequality is/are _____

$$\frac{(x^2 - 3)(x^4 + x^2 + 1)(2^x - 1)}{(3x + 1)^7 (x + 5)^2} \leq 0$$
5. A manufacturing company makes two types of television sets, one is black & white and other is color. The company has resources to make at most 300 sets a week. It takes Rs. 1800 to make a black & white set and Rs. 2700 to make a colored set. The company can spend not more than Rs. 648000 a week to make television sets, If it makes a profit of Rs. 510 per black & white set and Rs. 675 per colored set, how many colored sets should be produced so that the company has a maximum profit?

Space For Rough Work

FIITJEE INTERNAL TEST

BATCH: PANINI426-C1_PT1

PHYSICS, CHEMISTRY & MATHEMATICS

JEE MAIN-PHASE

Paper Code
100748

ANSWER KEY

SECTION – I

(PHYSICS)

PART – A

1.	T	2.	F	3.	R	4.	T
5.	E	6.	F	7.	T	8.	T
9.	E	10.	R	11.	E	12.	F
13.	R	14.	E	15.	R	16.	T
17.	E	18.	E	19.	T	20.	E

PART – B

1.	2	2.	1.60	3.	5	4.	13
5.	4.23 (range: 4.20 - 4.25)						

SECTION – II

(CHEMISTRY)

PART – A

1.	R	2.	T	3.	E	4.	R
5.	E	6.	R	7.	T	8.	T
9.	T	10.	T	11.	R	12.	T
13.	R	14.	F	15.	R	16.	E
17.	T	18.	R	19.	R	20.	T

PART – B

1.	0.1	2.	8	3.	55.8	4.	0.1
5.	1.92						

SECTION – III (MATHEMATICS)

PART – A

1.	R	2.	R	3.	F	4.	F
5.	R	6.	F	7.	T	8.	E
9.	T	10.	F	11.	F	12.	F
13.	T	14.	T	15.	F	16.	R
17.	R	18.	T	19.	E	20.	T

PART – B

1.	3	2.	4	3.	9	4.	3
5.	120						