FIITJEE Talent Reward Exam

for student presently in

Class 11

PAPER–1

Time: 3 Hours ***Maximum Marks: 214***

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.

1. This Question Paper Consists of 7 Comprehension Passages based on Physics, Chemistry and Mathematics which has total **29 objective type questions.**
2. All the Questions are Multiple Choice Questions having only **one correct answer**. Each question from **Q. 1 to 9** carries **+6 marks** for correct answer and **–2 marks** for wrong answer. Each question from **Q. 10 to 29** carries **+8 marks** for correct answer and **–3 marks** for wrong answer.
3. Answers have to be marked on the OMR sheet.
4. The Question Paper contains blank spaces for your rough work. No additional sheets will be provided for rough work.
5. Blank papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.
6. **Before attempting paper write your Name, Registration number** and **Test Centre** in the space provided at the bottom of this sheet.

Note:

Check all the sheets of this question paper. Please ensure the same SET is marked on header of all the sheets inside as indicated above 'Maximum Marks' of this page. In case SET marked is not the same on all pages, immediately inform the invigilator and CHANGE the Questions paper.

Registration Number : ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

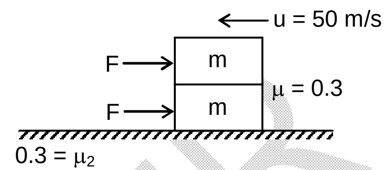
Name of the Candidate : ______________________________

Test Centre : ______________________________

SECTION – I
(COMPREHENSION TYPE)

Passage - 1
(For questions no. 1 - 3)

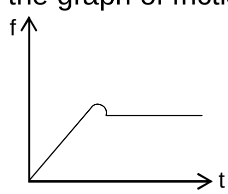
Two blocks each of mass ‘m’ = 2 kg are kept on each other. Both the blocks are having initial speed = 50 m/s. After time t = 2s two equal forces F = 10 N are applied on each block as shown in diagram. After t = 4s the lower surface starts applying friction and upper block is removed gently (take the direction of applied force as positive direction)



1. Calculate the displacement covered by each block in t = 4s
   (A) 0 (B) 60 m
   (C) 190 m (D) 140 m

2. What is the value of friction on upper block upto 4s?
   (A) 0 (B) 10 N
   (C) 15 N (D) 20 N

3. Draw the graph of friction verses time at lower surface after 4s.

(A)


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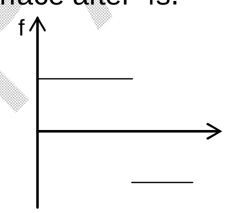

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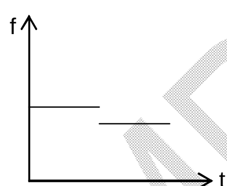

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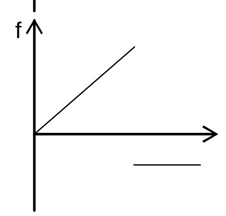
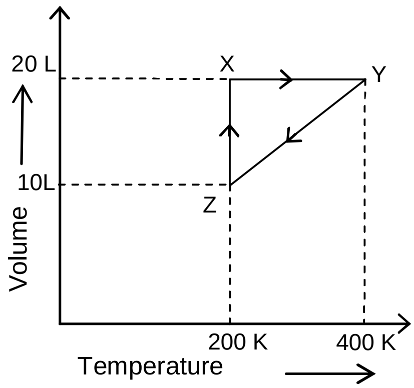


Space For Rough Work

Passage - 2
(For questions no. 4 - 6)

Thermodynamic processes taking place at constant temperature are called isothermal processes. Those taking place at constant volume and at constant pressure respectively are called isochoric and isobaric processes. Processes accompanying with no heat change are called adiabatic processes. Consider one mole of an ideal gas undergoes the following processes $X \rightarrow Y \rightarrow Z \rightarrow X$ in the given figure.



Answer the following questions on the basis of above write up.

4. Which of the following process is represented by the path $X \rightarrow Y$?
(A) Isothermal (B) Isobaric
(C) Isochoric (D) Adiabatic

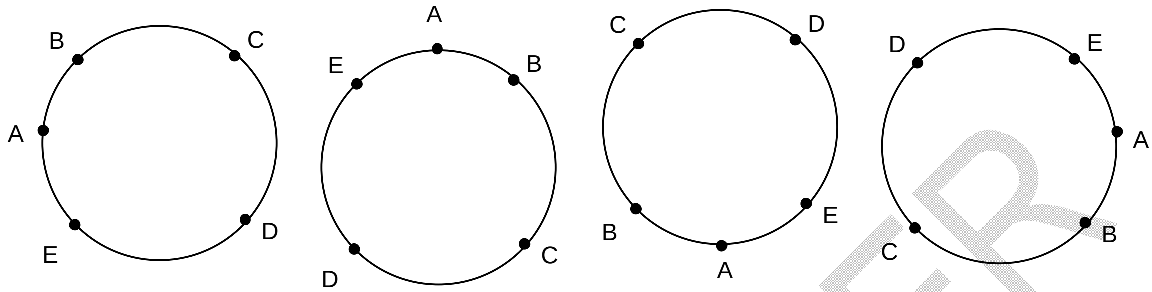
5. The process which occurs in going from $Y \rightarrow Z$ is:
(A) Isothermal (B) Adiabatic
(C) Isochoric (D) Isobaric

6. How much work is done in the process $X \rightarrow Y$?
(A) 1.8 Joule (B) 8.21 Joule
(C) 2.6 Joule (D) None of these

Space For Rough Work

Passage - 3
(For questions no. 7 - 9)

Arrangement round a circular table: A circular table has no head and arrangements like these in the figure given below are considered identical.



If n persons are arranged in a straight line, there are n! different ways in which this can be done. When n persons sit round a circular table, each circular arrangement will be equivalent to n arrangements in a line, so there are (n – 1) ! different arrangement of n persons round a circle.
Alternatively, we can regard any one person as 'head' and place the other (n – 1) persons in $(n-1)!$ different ways.

$\therefore$ the number of circular permutations of n different persons taken all at a time $(n-1)!$ Arrangement of beads (all distinct) around a circular wire: A circular wire differs from a circular table because when we turn it over we see that the other side presents an arrangement of different beads different from that on the first side. If the wire on the left is turned over we obtain the arrangements on the right. Thus two different arrangements for persons around a circular table are same for beads around a circular wire. Thus number of ways in this case in $\frac{1}{2}(n-1)!$

Read the above points carefully and answer the following questions:

7. A round robin conference of prime ministers of 40 countries, including India and Pakistan is to be held. The number of ways in which prime ministers can be seated so that prime ministers of India and Pakistan are never together, is
(A) 37.38! (B) 38.38!
(C) 36.38! (D) 35.35!

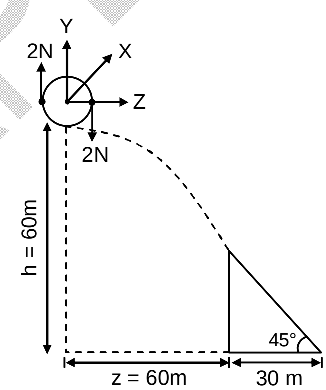
Space For Rough Work

8. A round robin conference of prime ministers of 40 countries is to be held. The number of ways in which they can be seated such that prime ministers of America and Britain are always together and those of Russia and India are always together, is
(A) $2\times37!$ (B) $4\times37!$
(C) $2\times38!$ (D) $4\times38!$

9. A round robin conference of prime ministers of 40 countries is to be held. The number of ways in which they can be seated so that prime minister of India neither sits with Pakistani counterpart nor with Chinese counterpart, is
(A) $111\times37!$ (B) $333\times37!$
(C) $666\times37!$ (D) $1332\times37!$

Passage - 4
(For questions no. 10 - 14)

Consider the situation on moon. From a space ship moving with $\vec{U}_x = 10$ m/s $\hat{i}$ in X-Y plane at height h = 60 m from surface of moon, a solid spherical ball of m = 100 gm and radius r = 1 m at t = 0 is thrown perpendicular to plane of motion of space ship. At the time ball is thrown it is pressed by two fingers which apply equal and opposite force $\vec{F} = \pm 2\,\hat{j}$ N at the diametrically opposite points, as shown in figure for t = 0.1414 s which rotates the ball in YZ plane clockwise. The ball falls on incline of inclination 45° and base length 30 m. Incline is also moving with same velocity ($\vec{U}_x$ = 10 m/s) as space ship. Perpendicular distance between X-Y plane of space ship and top of incline is z = 60 m. (g_{moon} = g/6 and g = 10 m/s^2) neglect radius of ball w.r.t. height.



10. Calculate the time taken ball to reach top of incline from space ship
(A) 5 s (B) 6 s
(C) 8 s (D) zero

11. Find the speed of centre of ball with which it was thrown relative to space ship.
(A) 10 m/s (B) 25 m/s
(C) 30 m/s (D) 40 m/s

Space For Rough Work

12. What is the acceleration of ball at t = 7th sec?
(A) 10.30 m/s^2 (B) 0.85 m/s^2
(C) 7.07 m/s^2 (D) 1.17 m/s^2

13. Calculate the speed of centre of ball when it reaches the bottom of incline w.r.t. ground.
(A) 10.3 m/s (B) 16.5 m/s
(C) 17.2 m/s (D) zero

14. Find the ratio of linear kinetic energy to total kinetic energy
(A) 65 : 84 (B) 1 : 1
(C) 30 : 70 (D) 7 : 15

Passage – 5
(For questions no. 15 - 19)

The product of the concentrations (in mol L^{-1}) of the ions of an electrolyte raised to power of their coefficients in the balanced dissociation equation in the solution at any concentration is known as ionic product (I.P). It's value changes with change in concentration and temperature. If the solution is saturated, the ionic product is called solubility product (K_{sp}) which depends only on temperature.

$Mg(OH)_2$ is sparingly soluble in water. It's solubility product (K_{sp}) in water is 5×10^{-13} at certain temperature.

Answer the following questions on the basis of above write up.

15. What is the molarity of the saturated aqueous solution of $Mg(OH)_2$?
(A) 4×10^{-2} M (B) 5×10^{-5} M
(C) 4×10^{-5} M (D) 3×10^{-3} M

16. What is the solubility of $Mg(OH)_2$ in water in g/litre?
[Molecular mass of $Mg(OH)_2$ = 58]
(A) 4.1×10^{-3} g/L (B) 5×10^{-5} g/L
(C) 2.9×10^{-3} g/L (D) 3.6×10^{-3} g/L

17. What is the pH of its saturated solution?
(A) 8 (B) 10
(C) 9 (D) 4

Space For Rough Work

18. What is the minimum pH necessary to cause a precipitate of $Mg(OH)_2$ from a 0.5 M $Mg(NO_3)_2$ solution?
(A) 10
(B) 12
(C) 6
(D) 8

19. Find the moles of NH_4Cl required to prevent $Mg(OH)_2$ from precipitating in a litre of solution which contains 0.02 moles of NH_3 and 0.005 moles of Mg^{2+} ions.
[Given K_b $(NH_3) = 10^{-5}$]
(A) 2×10^2
(B) 0.02
(C) 0.2
(D) 2×10^3

Passage – 6
(For questions no. 20 - 24)

In a triangle if the sum of two sides is x and their product is $y\left(x \geq 2\sqrt{y}\right)$ such that $(x+z)(x-z) = y$ where z is the third side of the triangle.

On the basis of above information, answer the following questions:

20. Greatest angle of the triangle is
(A) 105^o
(B) 120^o
(C) 135^o
(D) 150^o

21. Circum radius of the triangle is
(A) x
(B) y
(C) z
(D) none of these

22. In radius of the triangle is
(A) $\frac{y}{2(z+x)}$
(B) $\frac{z}{2(x+y)}$
(C) $\frac{y\sqrt{3}}{2(z+x)}$
(D) $\frac{z\sqrt{3}}{(x+y)}$

Space For Rough Work

23. Area of the triangle is

(A) $\frac{y\sqrt{3}}{4}$ (B) $\frac{x\sqrt{3}}{4}$

(C) $\frac{z\sqrt{3}}{4}$ (D) none of these

24. The sides of the triangle are

(A) $\frac{x \pm \sqrt{(x^2 - 4y)}}{2}$, z (B) $\frac{y \pm \sqrt{(y^2 - 4z)}}{2}$, z

(C) $\frac{z \pm \sqrt{(z^2 - 4x)}}{2}$, z (D) none of these

Passage – 7
(For questions no. 25 - 29)

(1). The set of all elements which are either in the set A or in the set B or in both is called union of A and B. It is denoted by $A \cup B$. $A \cup B = \{x : x \in A \text{ or } x \in B\}$.

(2). The set of all elements which are common to both of the sets A and B is called intersection of A and B. It is denoted by $A \cap B$. $A \cap B = \{x : x \in A, x \in B\}$.

(3). A set A is called subset of set B if A is in B. It is denoted by $A \subseteq B$ In this case B is called superset of A.

(4). The set of all elements which are in the set A and not in the set B is called the difference of B in A. It is denoted by A – B. The set A – B is called complement of B in A. $A - B = \{x : x \in A, x \notin B\}$

(5). U is the universal set. If A is any set, then $U - A$ is called complement of A. It is denoted by A' or A^c. $A^c = \{x : x \in U, x \notin A\}$

Read the above carefully and answer the following questions:

25. What is the number of non – empty subsets of $\left\{x \middle| -1 \le \log_{\frac{1}{x}} 10 < -\frac{1}{2}, x \text{ integer}\right\}$?

(A) 2^{97} (B) $2^{98} - 1$

(C) $2^{89} - 1$ (D) $2^{90} - 1$

Space For Rough Work

26. Let $A = \{x | 2a+1 \le x \le 3a-5\}$ and $B = \{x | 3 \le x \le 22\}$ What is the set of values of a for which $A \ne \phi$ and $A \subseteq A \cap B$?

(A) $\{a | 1 \le a \le 9\}$ (B) $\{a | 6 \le a \le 9\}$

(C) $\{a | a \le 9\}$ (D) ϕ

27. Let $A = \left\{x \middle| \sqrt{x-2} \le 0\right\}$ and $B = \left\{x \middle| 10^{x^2-2} = 10^x\right\}$. What is $A \cap \bar{B}$?

(A) $\{2\}$ (B) $\{-1\}$

(C) $\{x | x \le 2\}$ (D) ϕ

28. How many subsets $\{a, b, c\}$ of $\{-3, -2, -1, 0, 1\, 2, 3\}$ are there such that the line $ax + by + c = 0$ makes an acute angle with the positive x – axis?

(A) 43 (B) 42

(C) 50 (D) None of these

29. Let $M = \left\{(x, y) \middle| y \ge x^2\right\}$ and $N = \left\{(x, y) \middle| x^2 + (y-a)^2 \le 1\right\}$. What is a necessary and sufficient condition for $M \cap N = N$?

(A) $a \ge \frac{5}{4}$ (B) $a = \frac{5}{4}$

(C) $a \ge 1$ (D) $0 < a < 1$

Space For Rough Work

FIITJEE Talent Reward Exam

Class 11
PAPER-1
ANSWERS

1.	**C**	2.	**A**	3.	**B**	4.	**C**
5.	**D**	7.	**A**	8.	**B**	9.	**D**
10.	**B**	11.	**A**	12.	**B**	13.	**B**
14.	**A**	15.	**B**	16.	**C**	17.	**B**
18.	**D**	19.	**B**	20.	**B**	21.	**D**
22.	**C**	23.	**A**	24.	**A**	25.	**D**
26.	**B**	27.	**D**	28.	**A**	29.	**A**