

FIITJEE Talent Reward Exam

for student presently in

Class 9



PAPER-1

Time: 3 Hours

CODE 9A

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:

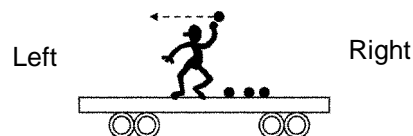
Check all the sheets of this question paper. Please ensure the same SET is marked on header of all the sheets inside as indicated above 'Maximum Marks' of this page. In case SET marked is not the same on all pages, immediately inform the invigilator and **CHANGE** the Questions paper.

Registration Number :
Name of the Candidate :
Test Centre :

Comprehension

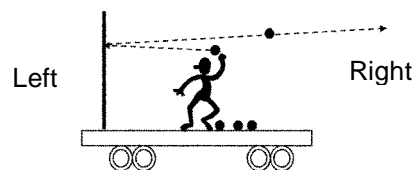
COMPREHENSION – 1 (Question No. 1 - 3)

The principle of conservation of linear momentum states that if in any assigned direction the net external force on a system is zero, then the linear momentum of the system will remain constant. Thus it can be concluded that if the momentum of a two particle system is initially zero, then because of internal forces they will move in opposite directions to conserve momentum. Answer the following questions:

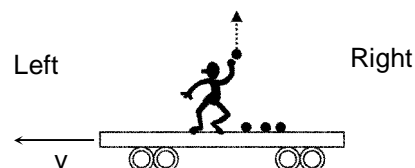


1. Suppose you are on a cart initially at rest on a frictionless track. If you throw a ball off the cart towards the left with a velocity v , will the cart be put into motion?
 (A) Yes, and it will move to the right with same velocity.
 (B) Yes, and it will move to the right with same momentum.
 (C) It may move left or right depending upon the mass of the ball
 (D) No, it will remain in place.

2. Suppose the cart of previous question is little bit modified and it has a vertical wall type surface on it as shown in the figure. You throw a ball at this vertical surface that is firmly attached to the cart. After the ball has bounced straight back from the surface as shown in the picture, will the cart be seen having motion?
 (A) Yes, and it will move to the right.
 (B) Yes, and it will move to the left.
 (C) It may move left or right depending upon the mass of the ball
 (D) No, it will remain in place.



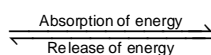
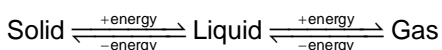
3. Suppose the mass of the cart along with your mass is 100 Kg and there are 4 balls each of mass 2 Kg. On the cart that is now moving at a constant speed 20m/s to the left on the frictionless track. If you throw a ball straight up (from your perspective), with a velocity 20 m/s how will the speed of the cart change?
 (A) The speed of the cart will be greater than 20 m/s.
 (B) The speed of the cart will be less than 20 m/s.
 (C) The speed of the cart will not change.
 (D) Can not be decided.



Space for Rough Work

COMPREHENSION – 2 (Question No. 4 - 6)

Physical Classification : Matter can exist in any one of three forms, (a) solid, (b) liquid and (c) gas. In the solid state, substances are rigid. They have a definite shape and fixed volume. In liquid state, substances have no definite shape but possess a fixed volume. They have the property of flowing. In a gaseous state, substances have no definite shape and volume.



Chemical classification : Matter exists in nature in the form of chemical substances. A pure substance is defined as a variety of matter, each sample of which has same composition and properties. Elements are pure substances that cannot be decomposed into simpler substances by chemical changes. Compounds are also pure substances that are composed of two or more different elements in a fixed proportion by mass. A mixture is a material containing two or more substances either elements or compounds or both in any proportion. The components of a mixture differ in many of their physical and chemical properties. Some preliminary methods of separation of components based on physical properties are

- (i) **Filtration** method is useful when one of the components is an insoluble solid in a solvent. The insoluble solid is obtained by filtration of the suspension through filter-paper.
- (ii) **Sublimation** is the process in which a solid substance is directly converted into its vapours by application of heat and vapour is reconverted into solid by subsequent cooling.

Now answer the following questions:

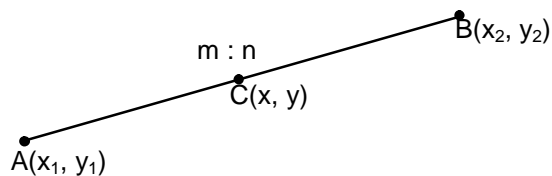
4. Which type of matter is formed after combining two or more chemically reactive substances?
 (A) Solution (B) Mixture
 (C) Compound (D) Element
5. During change of state in a matter, the temperature remains the same due to
 (A) Loss of heat (B) Less supply of heat
 (C) Latent heat (D) Lattice energy
6. A mixture that can be separated by sublimation method is
 (A) $I_2 + NH_4Cl$ (B) $I_2 + NaCl$
 (C) $MgCl_2 + NaCl$ (D) $PbCl_2 + NaCl$

Space for Rough Work

COMPREHENSION – 3 (Question No. 7 - 9)

Let A (x_1, y_1) and B (x_2, y_2) be the points on XY-plane, then the length of line segment

$$AB = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \text{ and if a point C (x, y) divide AB internally in the ratio } m : n \left(\text{i.e. } \frac{AC}{CB} = \frac{m}{n} \right)$$



$$\text{then } x = \frac{mx_2 + nx_1}{m + n} \text{ and } y = \frac{my_2 + ny_1}{m + n}.$$

7. Let A (0, 0), B (2, 2), C (4, 0) and D (x, y) be the vertices of a parallelogram, then co-ordinates of point D can be
 (A) (2, -2) (B) (2, 4)
 (C) (4, 2) (D) (0, 2)
8. If a line segment AB with points A (0, 0) and B (2, 2) is extended in both directions equally to P & Q such that PQ = 2AB, then coordinates of point Q can be
 (A) (-1, 0) (B) (-1, 3)
 (C) (3, -1) (D) (3, 3)
9. Let A (a, 0), B (3a, 0) and C (x, y) be the vertices of a triangle ABC. If a, x, & y are integers then
 (A) ABC can be an equilateral triangle (B) ABC cannot be equilateral triangle
 (C) ABC cannot be right angled triangle (D) none of these

Space for Rough Work

COMPREHENSION – 4 (Question No. 10 - 14)

There are two common types of spring balances used widely these days. Figure-1 and figure -2 show their basic structure with a block of mass $m = 5 \text{ Kg}$ hanging from first one. A cylindrical tank, with some liquid in it, is kept on the second balance which reads 200 N . Finally we have an arrangement where both the balances are brought close together (figure 3). Here, the block of mass $m = 5 \text{ kg}$ is fully submerged in to the liquid and the whole system is at rest. {Given: $g = 10 \text{ m/s}^2$, density of water 1000 kg/m^3 }

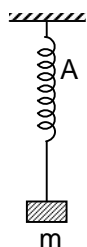


Figure 1

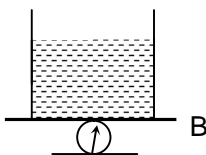


Figure 2

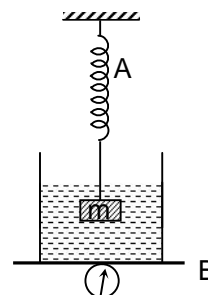


Figure 3

Now answer the following questions:

10. Considering the block m to be a cube of side 10 cm , what is its density in gram per cubic centimetre?
 (A) 5 (B) 50
 (C) 500 (D) 5000
11. Now considering that the relative density of the liquid in the tank is 2, In figure 3, what is the reading of balance A ?
 (A) 50 N (B) 40 N
 (C) 20 N (D) 30 N
12. For the same situation of previous question, what is the reading of balance B?
 (A) 200 N (B) 220 N
 (C) 180 N (D) 250 N

Space for Rough Work

13. Now look at figure 4, assume that the thread connecting the block m to the spring balance is mass-less. Now at a certain moment, the thread is gently cut at point C. Just after that moment what will be the acceleration of block m (in m/s^2)?

(A) 0
(C) 3

(B) 6
(D) 10

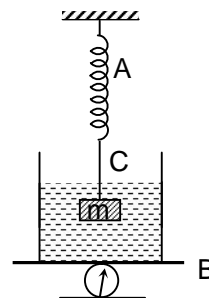


Figure 4

14. Now consider the same arrangement of figure 3 to be taken in to space where acceleration due to gravity is negligible.

Which of the following options is correct?

- (A) The reading of both the balances will remain unchanged
(B) The reading of both the balances will be zero.
(C) The buoyant force experienced by block m will remain unchanged.
(D) The buoyant force will decrease but won't be zero.

Space for Rough Work

COMPREHENSION – 5 (Question No. 15 - 19)

The term mole was introduced by Ostwald in 1896. A mole (mol) is defined as the number of atoms in 12.01g of carbon-12. The number of atoms in 12g of carbon-12 has been found experimentally to be 6.02×10^{23} . This number is also known as Avogadro's number named in honour of Amedeo Avogadro. A mole of oxygen atoms contains 6.02×10^{23} oxygen atoms and a mole of oxygen molecules contains 6.02×10^{23} oxygen molecules. Therefore, a mole of oxygen molecules is equal to two moles of oxygen atoms, i.e., $2 \times 6.02 \times 10^{23}$ oxygen atoms.

The mass of one mole atoms of any element is exactly equal to the atomic mass in grams (gram-atomic mass or gram atom) of that element. Similarly, the mass of 6.02×10^{23} molecules (1 mole) of a substance is equal to its molecular mass in grams or gram-molecular mass or gram molecule.

It has also been established by Avogadro's hypothesis that one gram-molecular mass of any gaseous substance occupies a volume of 22.4 litres at NTP. Thus, one mole, i.e., 6.02×10^{23} molecules of any gaseous substance occupies 22.4 litres as volume at NTP.

Therefore, number of mole of a substance

$$= \frac{\text{Mass of substance in gram}}{\text{Mass of one mole of the substance in gram}}$$

$$\text{Further, Number of moles} = \frac{\text{No. of particles}}{6.02 \times 10^{23}}$$

The molecular formula of a substance may be determined from the empirical formula if the molecular mass of the substance is known. The molecular formula is always a simple multiple of empirical formula and the value of simple multiple is obtained by dividing molecular mass with empirical formula mass. Hence, empirical formula of a compound can be defined as the simplest whole number ratio formula of the compound.

Consider the following table for compound 'X' :

Element	Percentage	Atomic Mass	Relative No. of atoms	Simplest ratio
Carbon	66.67%	12	$\frac{66.67}{12} = 5.55$	$\frac{5.55}{1.85} = 3$
Hydrogen	7.4%	1	$\frac{7.4}{1} = 7.4$	$\frac{7.4}{1.85} = 4$
Nitrogen	25.9%	14	$\frac{25.9}{14} = 1.85$	$\frac{1.85}{1.85} = 1$

Now based on the data given above, answer the following questions.

15. The empirical formula of the compound 'X' (as per given data) is
 (A) $C_{12}H_{16}N_4$ (B) $C_6H_8N_2$
 (C) C_3H_4N (D) $C_3H_4N_2$

Space for Rough Work

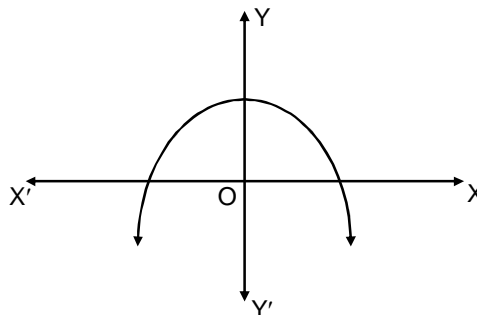
16. If the molecular mass of the compound 'X' is found to be 108 g/mol, then its molecular formula is:
(A) $C_{12}H_{16}N_4$ (B) $C_9H_{12}N_3$
(C) $C_6H_6N_2$ (D) $C_6H_8N_2$
17. Calculate the total number of atoms present in 54 g of the compound 'X' (N_A =avogadro's number)
(A) N_A (B) $16 N_A$
(C) $0.5 N_A$ (D) $8 N_A$
18. Upon complete combustion of the 54 g of the compound 'X', the total amount of carbon dioxide released will be
(A) 264 g (B) 88 g
(C) 132 g (D) 44 g
19. The released CO_2 (as Q. No. 18) is mixed with the same amount of laughing gas (N_2O) at NTP. Then, the total volume occupied by the mixture at NTP is
(A) 67.2 L (B) 44.8 L
(C) 22.4 L (D) 134.4 L

Space for Rough Work

COMPREHENSION – 6 (Question No. 20 - 24)

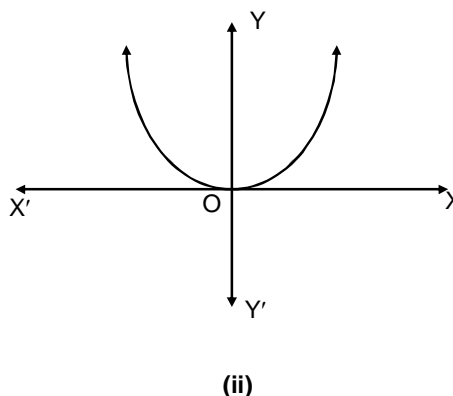
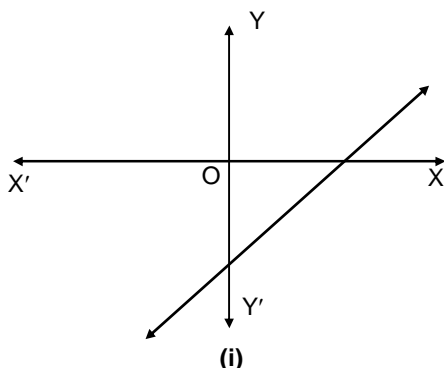
Zero of a polynomial is that value of x for which the value of the polynomial becomes zero. Number of zeroes of any polynomial is equal to the degree of the polynomial. The zeroes may be real (equal or unequal) or unreal.

20. According to the adjoining graph, the product of the zeroes of the polynomial will be
 (A) positive
 (B) negative
 (C) zero
 (D) cannot be determined



21. The ratio of sum of zeroes and product of zeroes of polynomial $2(x-1)(x-3)$ is
 (A) $\frac{3}{4}$
 (B) $\frac{3}{2}$
 (C) $\frac{2}{3}$
 (D) $\frac{4}{3}$

22. Consider graphs

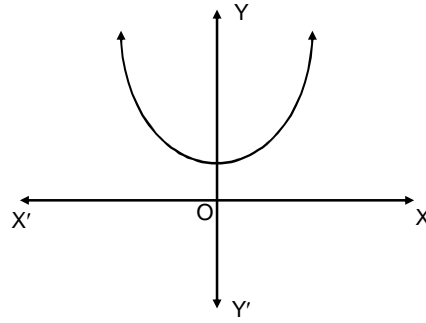


If a and b represent number of zeroes respectively for given figures

- (A) $a < b$
 (B) $a > b$
 (C) $a = b$
 (D) cannot say
23. If it is known that -1 and 2 are the zeroes of $x^4 - 7x^3 + 9x^2 + 7x - 10$, then the other two zeroes are
 (A) $1, 5$
 (B) $-1, -5$
 (C) $1, -5$
 (D) $-1, 5$

Space for Rough Work

24. The graph of a polynomial $P(x)$ is as shown. The number of its zeroes are
(A) 2
(B) 1
(C) 0
(D) 3



Space for Rough Work

COMPREHENSION – 7 (Question No. 25 - 29)

A number 'n' when multiplied with 13 has only digit 7's in the product (i.e., 777 ...7). Let the product be denoted by m.

25. The number of digits in the smallest such 'n' is
(A) 4 (B) 5
(C) 6 (D) 7
26. The sum of distinct digits in the smallest such n is
(A) 19 (B) 24
(C) 33 (D) 40
27. All such possible numbers 'n' will also be divisible by
(A) 4 (B) 2
(C) 6 (D) 11
28. Let m_1, m_2, m_3, \dots , be all possible values of m where $m_1 < m_2 < m_3 < \dots$. If m_1 is least value of m then number of digits in m_2 is
(A) 8 (B) 10
(C) 12 (D) 14
29. How many distinct digits of smallest such 'n' can be written as the difference of squares of two natural numbers?
(A) 3 (B) 4
(C) 5 (D) 6
-

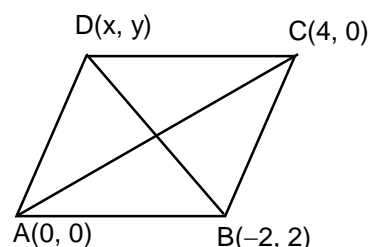
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FIITJEE TALENT REWARD EXAM

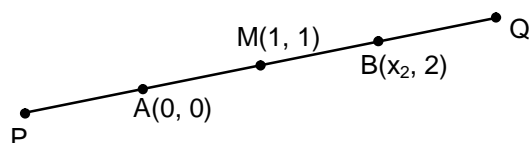
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CLASS IX HINTS (SET-A) PAPER-1

1. We choose the cart, man and the ball as the system. Since the ball is thrown to the left the remaining part of the system moves in opposite direction to conserve momentum. The cart will have same amount of momentum in opposite direction.
2. In this case, finally the ball moves in the right direction hence the car will move to the left.
3. Since the ball is thrown perpendicular to the motion of cart 'throwing' has no effect on cart. While in air, the ball will maintain its motion in the left hand direction.
4. Compound formation takes place because substances are chemically bonded together.
5. Latent heat is the amount of heat used up to overcome the forces of attraction between particles.
6. I_2 is sublime in nature where as NaCl is not. As a result, I_2 can be separated from NaCl by sublimation.
7. Mid-point of AC is same as mid-point of BD
 $\Rightarrow 4 = 2 + x \Rightarrow x = 2$
 $0 = 2 + y \Rightarrow y = -2.$



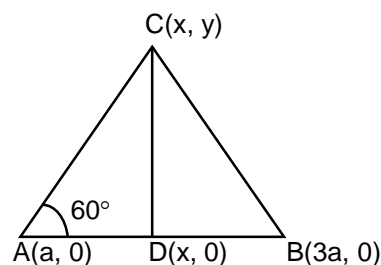
8. M is mid-point of AB and PQ.



9. Let $a \in \mathbb{I}$,

$$\Rightarrow \tan 60^\circ = \frac{y}{x-a} = \sqrt{3} \notin \mathbb{Q}.$$

Hence either x or y is irrational if $a \in \mathbb{I}$.



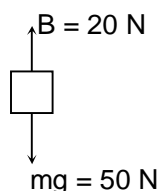
10. $\text{density} = \frac{\text{mass}}{\text{volume}} = \frac{5 \times 1000}{10 \times 10 \times 10} \frac{\text{gm}}{\text{cm}^3} = 5 \text{ gm/cm}^3$

11. Buoyant force on block = weight of the liquid displaced = 20 N
Reading of Balance A = $(50 - 20) \text{ N} = 30 \text{ N}$

12. Since the buoyant force is a contact force and it obeys Newton's 3rd law the reading of balance B is $200 + 20 = 220 \text{ N}$

13. After cutting the rope f.b.d. of block

$$a = \frac{50 - 20}{5} = 6 \text{ m/s}^2$$



14. The block will be weightless. Hence it does not exert any force.

15. $\text{C}_3\text{H}_4\text{N}$ is the simplest whole number ratio formula of the compound.

16. Empirical formula mass = $12 \times 3 + 1 \times 4 + 14 = 54$

$$\therefore n = \frac{108}{54} = 2$$

$$\Rightarrow \text{Molecular formula} = [\text{C}_3\text{H}_4\text{N}]_2 = \text{C}_6\text{H}_8\text{N}_2$$

17. 1 mole = N_A molecules of $\text{C}_6\text{H}_8\text{N}_2$
= $16 N_A$ atoms

$$\therefore 54 \text{ g of the compound} = \frac{54}{108} = 0.5 \text{ mole}$$

$$= (16 N_A) \times 0.5 \text{ atoms} = 8 N_A$$

18. 1 mole of $\text{C}_6\text{H}_8\text{N}_2$ upon complete combustion gives 6 moles of CO_2
 $\therefore 0.5$ moles of $\text{C}_6\text{H}_8\text{N}_2$ upon combustion gives = 3 moles of CO_2
= $3 \times 44 = 132 \text{ g}$

19. 3 moles CO_2 + 3 moles of N_2O
= $6 \times 22.4 = 134.4 \text{ L}$

20. Positive \times negative = negative.

21. $\alpha = 1, \beta = 3$
 $\therefore \frac{\alpha + \beta}{\alpha\beta} = \frac{4}{3}$

22. Figure (ii) has two equal roots.
23. $(x + 1)(x - 2)$ divides $x^4 - 7x^3 + 9x^2 + 7x - 10$ to give quadratic polynomial $(x - 1)(x - 5)$
 \therefore other two zeroes are 1, 5.
24. Graph is not intersecting the x-axis.
25. Least such 'n' is $n = 59829 \Rightarrow$ number of digits = 5.
26. Sum of distinct digits = 24.
27. n is also divisible by 11.
28. $m_2 = 777777777777$
29. $x = 59829$, where $5 = 3^2 - 2^2$, $9 = 5^2 - 4^2$, $8 = 3^2 - 1^2$
2 cannot be written as the difference of squares of two natural numbers.