

### Sample Paper

for Students presently in Class IX

#### Paper 3

NSEJS, JEE (Main) & JEE (Advanced)

Duration : 90 minutes

Maximum Marks : 141

Please read the instructions and guidelines carefully :

**Important Note :** Please ensure to accurately input the details for the Class and Paper No. as indicated at the top of this sheet into the corresponding columns / fields on the OMR sheet before proceeding with the paper. Incorrectly filled information regarding the class or paper may result in inaccurate outcomes or results.

*"This paper has been scientifically designed to evaluate your potential – manifested and hidden for the target examinations mentioned in various sections of the paper. Thus, your adherence to the instructions is critical in the evaluation of the same"*

1. This Question paper consists of 3 sections.
2. Student should devote allotted time for each section. If a section is easy, then it is easy for everyone & was meant to be like that with a goal in mind. Do not switch over to another section if you find the section to be easy. If a section is tough, then it is tough for everyone. You are advised to spend 30 Minutes on Section-I, 30 Minutes on Section-II and 30 Minutes on Section-III. Dedicating the required time to finish each section successfully is essential. Opening the next section before completing the allotted time for the preceding section is not permitted. This adherence is crucial for assessing your true potential, as each section is meticulously crafted to evaluate your potential for the corresponding competitive examinations.
3. Candidate should open the seal of Section-II only after devoting 30 minutes on Section-I and Seal for Section-III is to be opened only after devoting 30 minutes on Section-II.
4. Sheets will be given to each candidate for rough work. Candidate must fill all details on the rough sheet and submit the same to invigilator along with OMR sheet. Candidate must mention the Question No. while doing the rough work in the sheet.
5. Please note candidates are not allowed to bring any prohibited items into the exam hall such as electronic devices, mobile phones, smart watch, earphones, calculators, books, notes, formula sheets, and bags.
6. Marking scheme is given in table below:

Section	Subject	Question no.	Marking Scheme for each question	
			Correct answer	Wrong answer
SECTION – I (NSEJS) Time Allotted: 30 Minutes	PHYSICS (PART-A)	1 to 4	+3	-1
	CHEMISTRY (PART-B)	5 to 8	+3	-1
	BIOLOGY (PART-C)	9 to 12	+3	-1
SECTION – II (JEE Main) Time Allotted: 30 Minutes	PHYSICS (PART-A)	13 to 17	+4	-1
	CHEMISTRY (PART-B)	18 to 22	+4	-1
	MATHEMATICS (PART-C)	23 to 27	+4	-1
SECTION – III (JEE Advanced) Time Allotted: 30 Minutes	PHYSICS (PART-A)	28 to 32	+3	-1
	CHEMISTRY (PART-B)	33 to 37	+3	-1
	MATHEMATICS (PART-C)	38 to 42	+3	-1

# Section - I

Time: 30 Minutes

## PHYSICS - (PART - A)

This part contains **TWO (02)** comprehensions. Based on each comprehension, there are **TWO (02)** questions of **Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

### Comprehension-1 for Q. No. 1 to 2

Mechanical energy exists in two forms: Kinetic energy and potential energy. Kinetic energy is the energy possessed by virtue of motion of a body. Potential energy is the energy possessed by virtue of its position or configuration. These two forms of energy are inter convertible. If no other forms of energy is involved in a process, the sum of kinetic energy and potential energy always remains constant.

- Two particles of masses  $m_1$  and  $m_2$  have equal linear momenta. The ratio of their kinetic energy is  
(A) 1  
(B)  $\sqrt{\frac{m_2}{m_1}}$   
(C)  $\frac{m_2}{m_1}$   
(D)  $\left(\frac{m_2}{m_1}\right)^2$
- Two particles of masses  $m_1$  and  $m_2$  have equal kinetic energies. The ratio of their linear momenta  $\frac{p_1}{p_2}$  is  
(A) 1  
(B)  $\sqrt{\frac{m_2}{m_1}}$   
(C)  $\sqrt{\frac{m_1}{m_2}}$   
(D)  $\left(\frac{m_2}{m_1}\right)^2$

### Comprehension-2 for Q. No. 3 to 4

Two bodies of masses 1 kg and 4 kg respectively are placed at a separation of 2 m. Assuming that only gravitational forces act.

- Find the force with which 1 kg mass attracts 4 kg mass.  
(A)  $6.67 \times 10^{-11}$  N  
(B)  $1.33 \times 10^{-10}$  N  
(C)  $133 \times 10^{-10}$  N  
(D)  $2.66 \times 10^{-10}$  N
- Find the acceleration of 1 kg mass.  
(A)  $6.67 \times 10^{-11}$  m/s<sup>2</sup>  
(B)  $1.33 \times 10^{-10}$  m/s<sup>2</sup>  
(C)  $1.3 \times 10^{-10}$  m/s<sup>2</sup>  
(D)  $2.66 \times 10^{-10}$  m/s<sup>2</sup>

## CHEMISTRY – (PART – B)

This part contains **TWO (02)** comprehensions. Based on each comprehension, there are **TWO (02)** questions of **Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

## Comprehension-1 for Q. No. 5 to 6

For two gases having densities  $d_1$  and  $d_2$  and rates of diffusion  $r_1$  and  $r_2$  under similar conditions of temperature and pressure

$$\frac{r_1}{r_2} = \sqrt{\frac{d_2}{d_1}}$$

Here, the term 'Rate of effusion or diffusion' implies as under:

Rate of effusion/diffusion

$$= \frac{\text{Volume of the gas effused / diffused}}{\text{Time taken}}$$

As mol. mass = 2 × vapour density, we can also write

$$\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}$$

where  $M_1$  and  $M_2$  are the molecular masses of the two gases.

- X ml of  $H_2$  effuse out through a hole in a container in 5 seconds. The time taken for the effusion of the same volume of the gas specified below under identical conditions is  
 (A) 10 sec. ;  $H_2$  (B) 20 sec. ;  $O_2$   
 (C) 25 sec. ; CO (D) 55 sec. ;  $CO_2$
- Containers A, B and C of equal volume contain oxygen, neon and methane respectively at the same temperature and pressure. The correct increasing order of their rate of diffusion is  
 (A)  $A < B < C$  (B)  $B < C < A$   
 (C)  $C < A < B$  (D)  $C < B < A$

## Comprehension-2 for Q. No. 7 to 8

Compounds isolated from natural sources are seldom pure. They are generally mixed with other substances which also occur along with them. Similarly, the compounds prepared in the laboratory are also not pure since they are generally contaminated with other products that result from the side reactions. It, therefore, becomes essential to obtain the substance in the purest form in order to characterise it thoroughly. A large number of methods are available for the purification of substances. The choice of the method, however, depends upon the nature of the substance (whether solid or liquid) and the type of impurities present in it. Following are some of the important methods which are commonly employed for the purification of organic compounds

(1) Filtration, (2) Crystallisation or Recrystallization, (3) Fractional crystallisation, (4) Sublimation, (5) Simple distillation, (6) Fractional distillation, (7) Distillation under reduced pressure, (8) Steam distillation, (9) Differential extraction, and (10) Chromatography.

- Naphthalene can be easily purified from common salt by  
 (A) sublimation (B) crystallisation  
 (C) distillation (D) extraction with a solvent
- Two volatile liquids A and B differ in their boiling points by 15K. The process which can be used to separate them is  
 (A) fractional distillation (B) steam distillation  
 (C) distillation under reduced pressure (D) simple distillation

**BIOLOGY – (PART – C)**

This part contains **TWO (02)** comprehensions. Based on each comprehension, there are **TWO (02)** questions of **Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

**Comprehension–1 for Q. No. 9 to 10**

Cell membranes protect and organize cells. Most importantly they serve as barriers, discriminating the cell's interior from the outer medium. Because cells always exist in aqueous environment their membranes should be structured in such a way so they do not get dissolve in water. This is carried by special chemical molecules - phospholipids. These molecules are constructed from two parts: tails made of fat that 'avoid' water and heads that have an affinity for water. For this specific behaviour the phospholipid's tails are called hydrophobic ('hydro' means water and 'phobia' means fear) and heads are called hydrophilic ('philos' means love). When phospholipids are added to water, they self-assemble into double-layered structures, shielding their hydrophobic portions from water and exposing their hydrophilic portions to the environment. This phospholipid bilayer may resemble a sandwich, where phospholipid heads are bread rolls and tails are the sandwich filling. The membranes are also loaded with proteins.

9. Tails of phospholipids are:  
(A) Hydrophobic (B) Hydrophilic  
(C) Lipophobic (D) Lipophilic
10. Cell membrane is made up of  
(A) Only phospholipids (B) Only proteins  
(C) Both phospholipid and proteins (D) None of these

**Comprehension–2 for Q. No. 11 to 12**

It is useful to think of the immediate causes of disease as belonging to two distinct types. One group of causes is the infectious agents, mostly microbes or micro-organisms. Diseases where microbes are the immediate causes are called infectious diseases. This is because the microbes can spread in the community, and the diseases they cause will spread with them. On the other hand, there are also diseases that are not caused by infectious agents. Their causes vary, but they are not, due to external causes like microbes that can spread in the community. Instead, these are mostly internal, non-infectious causes.

For example, some cancers are caused by genetic abnormalities. High blood pressure can be caused by excessive weight and lack of exercise. Similarly, diabetes is not infectious.

11. Which of the following is infectious disease?  
(A) High blood pressure (B) Eye flu  
(C) Diabetes (D) Cancer
12. Infectious diseases can be spread by  
(A) Fungi (B) Bacteria  
(C) Protozoa (D) All of these

## Section – II

**Time: 30 Minutes**

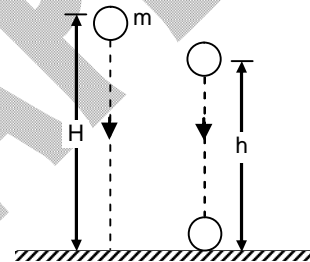
### PHYSICS – (PART – A)

This part contains **TWO (02)** comprehensions. Based on each comprehension, there are **THREE (03)** questions in Comprehension-1 & **TWO (02)** questions in Comprehension-2 of **Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

#### Comprehension-1 for Q. No. 13 to 15

A ball of mass  $m$  is dropped from a height  $H$  above a level floor as shown in figure. After striking the ground it bounces off back and reaches up to height  $h$ .

Based on above information, answer the following questions:

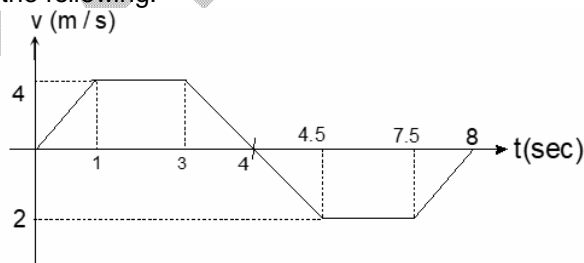


13. Change in momentum of the ball on striking is  
 (A)  $\sqrt{2g} m(\sqrt{H} + \sqrt{h})$  (B)  $\sqrt{2g} m(\sqrt{H} - \sqrt{h})$   
 (C)  $m\sqrt{2g(H-h)}$  (D) None of these
14. Loss in energy just before and after striking is  
 (A)  $mgh$  (B)  $mgH$   
 (C)  $mg(H-h)$  (D) zero
15. Difference in potential energy at the highest points of both situations is  
 (A)  $mgH$  (B)  $mg(H+h)$   
 (C)  $mg(H-h)$  (D) Zero

#### Comprehension-2 for Q. No. 16 to 17

The velocity time graph of a linear motion is shown in figure.

Answer the following.



16. Displacement of particle in 8 sec  
 (A) 5 m (B) 16 m  
 (C) 8 m (D) 6 m

17. Average speed of particle in 8 sec
- (A)  $\frac{5}{8}$  m/s (B)  $\frac{19}{8}$  m/s  
 (C) 0 m/s (D) 3 m/s

## CHEMISTRY – (PART – B)

This part contains **TWO (02)** comprehensions. Based on each comprehension, there are **THREE (03)** questions in Comprehension-1 & **TWO (02)** questions in Comprehension-2 of **Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

### Comprehension-1 for Q. No. 18 to 20

The clouds consists of charge particles of water dispersed in air. Some of them are +vely charged, others are –vely charged. When similar charged clouds come closer they cause lightening and thundering whereas, when +ve and –ve charge clouds some closer they cause heavy rain by aggregation of minute particles. It is possible to cause artificial rain by throwing electrified sand or silver iodide from an aeroplane and thus coagulating the mist hanging in air

18. Clouds are colloidal dispersions of:
- (A) water in air (B) Air in water  
 (C) Air in solid (D) Solid in air
19. The dispersion of liquid or solid in air is called
- (A) aerosol (B) foam  
 (C) gels (D) sol
20. Which of the following is not aerosol
- (A) Mist (B) Fog  
 (C) Automobile exhaust (D) Foam

### Comprehension-2 for Q. No. 21 to 22

A change in which two or more substance (reactants) combine to produce one or more new substance (products) that has/ have different chemical properties than the reactant is called chemical change. Change in which only physical properties of any substances get changed and no new substance is formed is called a physical change. Such as shape, size, colour and state, is known as physical change. A physical change is mostly reversible and during physical change no new substance are formed.

21. Which of the following statements is not correct?
- (A) In a chemical change, colour of the object may change  
 (B) In a chemical change, heat will always be released  
 (C) A chemical change always involves physical state  
 (D) Rusting of iron becomes faster when humidity is high
22. Which of the following is a chemical change?
- (A) Foul smell comes when food gets spoiled  
 (B) Pollution of air due to explosion of fire-work  
 (C) Change in colour of a cut apple if left outside  
 (D) All of the above

## MATHEMATICS – (PART – C)

This part contains **TWO (02)** comprehensions. Based on each comprehension, there are **THREE (03)** questions in Comprehension-1 & **TWO (02)** questions in Comprehension-2 of **Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

### Comprehension-1 for Q. No. 23 to 25

If  $\alpha, \beta$  are zeroes of polynomial  $p(x) = ax^2 + bx + c$  then  $\alpha + \beta = -\frac{b}{a}$ , and  $\alpha\beta = \frac{c}{a}$

If  $\alpha$  and  $\beta$  are the zeros of the quadratic polynomial  $p(y) = 5y^2 - 7y + 1$

23. Find the value of  $\frac{1}{\alpha} + \frac{1}{\beta}$
- (A) 7 (B) -7  
(C) 3 (D) -8
24. Find the value of  $\alpha^2 + \beta^2 =$
- (A)  $-\frac{39}{25}$  (B)  $\frac{29}{35}$   
(C)  $\frac{59}{25}$  (D) none of these
25. Find the value of  $\alpha^3 + \beta^3$
- (A)  $\frac{226}{125}$  (B)  $\frac{238}{125}$   
(C)  $\frac{239}{125}$  (D)  $\frac{237}{125}$

### Comprehension-2 for Q. No. 26 to 27

Let A and B be two given points whose co-ordinates are given by  $A(x_1, y_1)$  and  $B(x_2, y_2)$  respectively.

Then  $AB = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$  and mid-point of AB is  $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ .

26. If (9, a) is at the distance of 5 units from the point (a, 2), then the value of a is
- (A) 6 (B) 3  
(C) 4 (D) 7
27. The perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0) is
- (A) 10 (B) 12  
(C) 14 (D) 16

## Section – III

Time: 30 Minutes

### PHYSICS – (PART – A)

This part contains **TWO (02)** comprehensions. Based on each comprehension, there are **THREE (03)** questions in Comprehension-1 & **TWO (02)** questions in Comprehension-2 of **Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

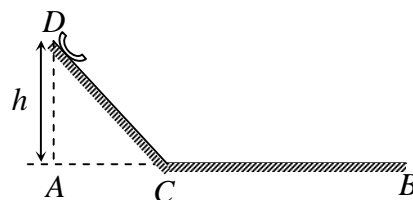
#### Comprehension-1 for Q. No. 28 to 30

Two boys (at ground) simultaneously aim their guns at a bird sitting on a tower. The first boy releases his shot with speed of  $100\sqrt{2}$  m/s at an angle  $45^\circ$  with the horizontal. The second boy is behind the first boy by a distance  $100(\sqrt{3} - 1)$  m and releases his shot with speed 200 m/s. Both the shots hit the bird simultaneously.

28. Angle of projection of the shot fired by the second boy is  
 (A)  $\frac{\pi}{6}$  (B)  $\frac{\pi}{3}$   
 (C)  $\frac{\pi}{4}$  (D) none of these
29. After what time shots hit the bird  
 (A) 1.5 s (B) 2 s  
 (C) 1 s (D) none of these
30. What would be the time of flight for first shot if there were no targets to hit?  
 (A) 10 sec (B) 20 sec  
 (C) 5 sec (D) 12 sec

#### Comprehension-2 for Q. No. 31 to 32

A sledge of mass  $m$  slides down from point  $D$  on an icy hill of height  $h$  (as shown) and stops after covering a distance  $CB$ . The distance  $AB$  is equal to  $s$ . The co-efficient of friction between all the contact surfaces is same.



31. The co-efficient of friction between sledge and the icy surface is  
 (A)  $\frac{2h}{3s}$  (B)  $\frac{h}{s}$   
 (C)  $\frac{s}{2h}$  (D)  $\frac{s}{3h}$
32. The work done by friction till the sledge reaches point  $B$  is  
 (A)  $-mgh$  (B)  $-mg\sqrt{h^2 + s^2}$   
 (C)  $-mg(s - h)$  (D)  $-mg(s + h)$



## CHEMISTRY – (PART – B)

This part contains **TWO (02)** comprehensions. Based on each comprehension, there are **THREE (03)** questions in Comprehension-1 & **TWO (02)** questions in Comprehension-2 of **Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

## Comprehension-1 for Q. No. 33 to 35

To calculate the number of atoms first step is to calculate the number of moles. If the mass of an element/compound is given then divided the given mass by the molar mass of the element/compound to find the number of moles. In 1 mole of a substance, the number of atoms is  $N_A$  or  $6.023 \times 10^{23}$  atoms.

33. Which has maximum number of atoms?  
 (A) 24 g of C (B) 56 g of Fe  
 (C) 27g of Al (D) 108 g of Ag
34. Which of the following has the largest number of molecules?  
 (A) 1 mol He (B) 22.4 L  $CO_2$  at STP  
 (C) 180 g glucose (D) All are equal
35. Which among the following is the mass of two molecules of water?  
 (A)  $5.98 \times 10^{-23}$  g (B) 36 g  
 (C) 18 g (D)  $36 \times 10^{-23}$  g

## Comprehension-2 for Q. No. 36 to 37

An ice cube at  $-20^\circ C$  was put to heat. During this experiment the thermometer stops reading for some time after it starts reading again and again after some time it stops finally though the heat supply was continuous till end

36. What could be the possible reason when thermometer stops reading first time?  
 (A) Mercury inside the thermometer go freeze  
 (B) Heat supplied was changing into potential energy completely  
 (C) Possibly Thermometer lost contact with ice  
 (D) Can't say anything
37. If 40 g of ice was taken then what amount of heat have been absorbed by ice on reaching the temperature of  $-5^\circ C$ . (Specific heat ice =  $0.5 \text{ cal/g}^\circ C$ )  
 (A) 300 cal (B) 100 cal  
 (C) 200 cal (D) 600 cal

## MATHEMATICS – (PART – C)

This part contains **TWO (02)** comprehensions. Based on each comprehension, there are **THREE (03)** questions in Comprehension-1 & **TWO (02)** questions in Comprehension-2 of **Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

### Comprehension-1 for Q. No. 38 to 40

$f(x) = a_0 + a_1 x + a_2 x^2 + \dots + a_n x^n$  is divided by  $(x-k)$ , then remainder is  $f(k)$ .

38. The remainder when  $x^{2014}$  is divided by  $x^2 - 1$   
 (A) 1 (B)  $-1$   
 (C)  $x + 1$  (D)  $x - 1$
39. The remainder when  $x^{2014}$  is divided by  $x^2 - 3x + 2$  is  
 (A) 2014 (B)  $2014x - 2013$   
 (C)  $(2^{2014} - 2)x + (2 - 2^{2014})$  (D)  $(2^{2014} - 1)x + (2 - 2^{2014})$
40. What is the remainder when  $x^{2014} + 1$  is divided by  $x^3$ ?  
 (A)  $-1$  (B) 1  
 (C) 0 (D) None of these

### Comprehension-2 for Q. No. 41 to 42

$(-5, -10)$ ,  $(-15, 15)$ ,  $(5, 5)$  are the coordinates of vertices A, B and C respectively of  $\triangle ABC$ , and P is a point on median AD such that  $AP : PD = 2 : 3$

41. The coordinates of point D is  
 (A)  $(5, 10)$  (B)  $(-5, -10)$   
 (C)  $(5, -10)$  (D)  $(-5, 10)$
42. The coordinates of point P is  
 (A)  $(-5, -2)$  (B)  $\left(\frac{10}{3}, 5\right)$   
 (C)  $\left(\frac{10}{3}, \frac{5}{3}\right)$  (D) None of these

# DRONACHARYA

360° DIAGNOSTIC & SCHOLARSHIP EXAM

## Sample Paper

for Students presently in Class IX

### Paper 3

NSEJS, JEE (Main) & JEE (Advanced)

## ANSWER KEY

1.	C	2.	C	3.	A	4.	A
5.	B	6.	A	7.	A	8.	A
9.	A	10.	C	11.	B	12.	D
13.	A	14.	C	15.	C	16.	A
17.	B	18.	A	19.	A	20.	D
21.	B	22.	D	23.	A	24.	D
25.	B	26.	A	27.	B	28.	A
29.	C	30.	B	31.	B	32.	A
33.	A	34.	D	35.	A	36.	B
37.	B	38.	A	39.	D	40.	B
41.	D	42.	A				