FIITJEE

Diagnostic cum Scholarship Tests

SAMPLE PAPER

For Students of Class XII

Paper 3 JEE Advanced

Duration : 90 minutes

Paper Code: 1112-3

Maximum Marks : 135

Please read the instructions and guidelines carefully :

Important Note : Please ensure to accurately input the details for the Question Paper Code as indicated at the top of this sheet (Side 2) 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 consist only 1 section.
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 90 Minutes on Section-I. This adherence is crucial for assessing your true potential, as this section is meticulously crafted to evaluate your potential for the corresponding competitive examination.
3. 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.
4. 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.
5. Marking scheme is given in table below:

Section	Subject		Question no.	Marking Scheme for each question	
				Correct answer	Wrong answer
SECTION – I **JEE Advanced** **Time Allotted: 90 Minutes**	PHYSICS	(PART-A)	1 to 3	**+3**	**–1**
	CHEMISTRY	(PART-B)	4 to 6	**+3**	**–1**
	MATHEMATICS	(PART-C)	7 to 9	**+3**	**–1**
	PHYSICS	(PART-D)	10 to 11	**+4** *Partial Marking	**–2**
	CHEMISTRY	(PART-E)	12 to 13	**+4** *Partial Marking	**–2**
	MATHEMATICS	(PART-F)	14 to 15	**+4** *Partial Marking	**–2**
	PHYSICS	(PART-G)	16 to 22	**+4**	**–1**
	CHEMISTRY	(PART-H)	23 to 29	**+4**	**–1**
	MATHEMATICS	(PART-I)	30 to 36	**+4**	**–1**

*** Partial Marking: (Q. No. 10 to 15):**

Full Marks	**: +4**	If only (all) the correct option(s) is(are) chosen;
Partial Marks	**: +3**	If all the four options are correct but ONLY three options are chosen;
Partial Marks	**: +2**	If three or more options are correct but ONLY two options are chosen, both of which are correct;
Partial Marks	**: +1**	If two or more options are correct but ONLY one option is chosen and it is a correct option;
Zero Marks	**: 0**	If none of the options is chosen (i.e. the question is unanswered)
Negative Marks	**: -2**	In all other cases.

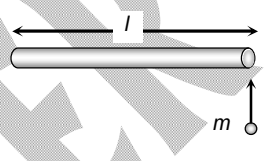
Section – I

Time: 90 Minutes

PHYSICS – (PART – A)

*This part contains **3 Multiple Choice Questions** number **1 to 3.** Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.*

1. A stick of length l and mass M lies on a frictionless horizontal surface on which it is free to move in any way. A ball of mass m moving with speed v collides elastically with the stick as shown in the figure. If after the collision ball comes to rest, then what should be the mass of the ball

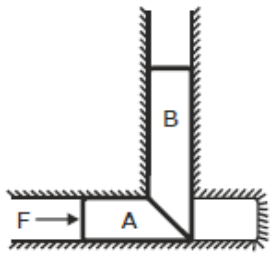


(A) m = 2M (B) m = M
(C) m = M/2 (D) m = M/4

2. The horizontal and vertical displacements of a particle moving along a curved line are given by $x = 5t$ and $y = 2t^2 + t$. Time after which its velocity vector makes an angle of 45° with the horizontal is

(A) 0.5 s (B) 1 s
(C) 2 s (D) 1.5 s

3. A side view of a simplified form of vertical latch B is as shown. The lower member A can be pushed forward in its horizontal channel. The sides of the channels are smooth, but at the interfaces of A and B, which are at 45° with the horizontal, there exists a static coefficient of friction μ = 0.4. What is the minimum force F (in N) that must be applied horizontally to A to start motion of the latch B upwards if it has a mass m = 0.6 kg?



(A) 10 N (B) 0
(C) 14 N (D) 22 N

CHEMISTRY – (PART – B)

*This part contains **3 Multiple Choice Questions** number **4 to 6.** Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.*

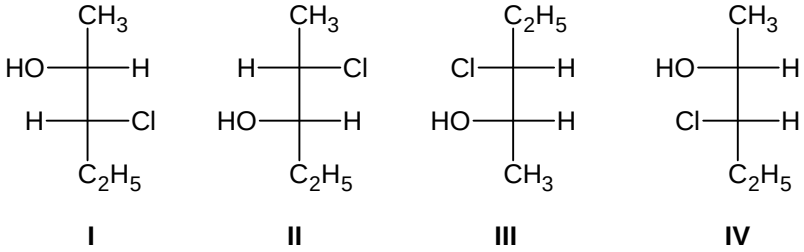
4. pH of 10^{-6} M NH_4OH(aq) solution will be ($K_b = 10^{-5}$)

(A) 6.02 (B) 7.0
(C) 7.98 (D) 8.56

5. If a proton and α-particle are accelerated through the same potential difference, the ratio of de Broglie wavelength λ_p and λ_α is

(A) 2 (B) 1
(C) $2\sqrt{2}$ (D) 3

6. Which two Fischer forms represent a pair of enantiomers?



I II III IV

(A) I & II
(B) III & IV
(C) I & IV
(D) II & III

MATHEMATICS – (PART – C)

*This part contains **3 Multiple Choice Questions** number **7 to 9.** Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.*

7. A chord of parabola $y^2 = 4ax$ touches another parabola $y^2 = 4bx$. The locus of point of intersection of tangents to extremities of this chord is conic whose latus rectum is

(A) $\frac{4a^2}{b}$
(B) $\frac{4b^2}{a}$
(C) $\frac{4a^2}{b^2}$
(D) None of these

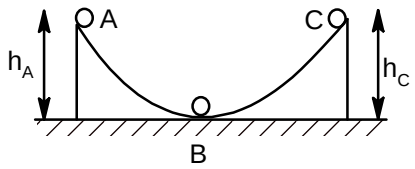
8. Number of common terms in two Ap's 2, 5, 8, 11, …..179 and 3, 5, 7, 9….., 101 are
(A) 16
(B) 17
(C) 18
(D) None of these

9. Length of focal chord of the parabola $y^2 = 16x$. Inclined at an angle 30^0 with the x-axis, is
(A) 4
(B) 16
(C) 64
(D) 128

PHYSICS – (PART – D)

*This part contains **2 Multiple Choice Multi Correct Type Questions** number **10 to 11.** Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE** is/are correct.*

10. A ball moves over a fixed track as shown in the figure. From A to B the ball rolls without slipping. If surface B to C is frictionless and K_A, K_B and K_C are kinetic energies of the ball at A, B and C respectively, then



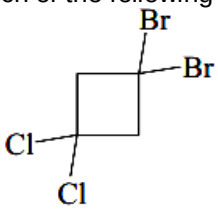
(A) $h_A > h_C$; $K_B > K_C$
(B) $h_A > h_C$; $K_C > K_A$
(C) $h_A = h_C$; $K_B = K_C$
(D) $h_A < h_C$; $K_B > K_C$

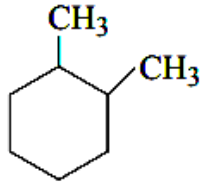
11. If a sample of metal weighs 210 g in air, 180 g in water and 120 g in a liquid :
(A) RD of metal is 3
(B) RD of metal is 7
(C) RD of liquid is 3
(D) RD of liquid is (1/3)

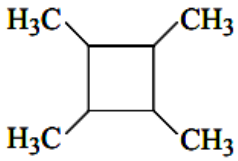
CHEMISTRY – (PART – E)

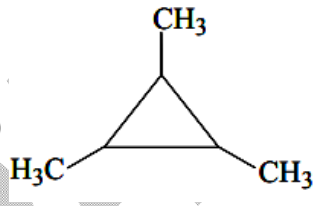
*This part contains **2 Multiple Choice Multi Correct Type Questions** number **12 to 13.** Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE** is/are correct.*

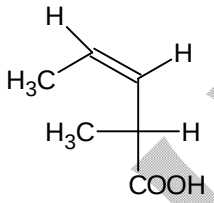
12. Which of the following compounds can show geometrical isomerism?

(A) 

(B) 

(C) 

(D) 

13. The structure  shows

(A) geometrical isomerism
(B) optical isomerism
(C) tautomerism
(D) none of these

MATHEMATICS – (PART – F)

*This part contains **2 Multiple Choice Multi Correct Type Questions** number **14 to 15.** Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE** is/are correct.*

14. If the equation $ax^2 + bx + c = 0 (a > 0)$ has two roots α and β such that $\alpha < -2$ and $\beta > 2$, then

(A) $b^2 - 4ac > 0$
(B) $c < 0$
(C) $a + |b| + c < 0$
(D) $4a + 2|b| + c < 0$

15. Tangents are drawn from the point $(-2,0)$ to the parabola $y^2 = 8x$. The radius of the circle touching these tangents and the corresponding chord of contact is equal to

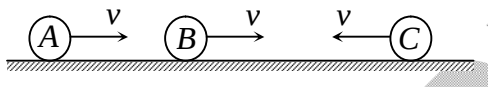
(A) $4(\sqrt{2}+1)$
(B) $4(\sqrt{2}-1)$
(C) $8\sqrt{2}$
(D) $4\sqrt{2}$

PHYSICS – (PART – G)

*This part contains **ONE (01)** comprehension. Based on comprehension, there are **THREE (03)** 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. 16 to 18

Two spheres *A* and *B* are moving on a smooth horizontal surface with same velocity *v* having some separation between them. A third sphere *C* is moving in opposite direction on same surface with same speed. All the spheres are of equal mass. The collisions are elastic. Let v_{cm} represents the centre of mass velocity of all the three spheres.



16. If *A* and *B* are connected to each other by a massless rigid rod, then the value of v_{cm} after all the possible collisions have occurred will be

(A) $\frac{v}{3}$ (B) $\frac{2v}{3}$

(C) v (D) $\frac{3v}{2}$

17. If *A* and *B* are connected to each other by a massless rigid rod, then during all the possible collisions

(A) momentum of *A* and *B* is conserved (B) momentum of *B* and *C* is conserved

(C) momentum of *B* and *C* is not conserved (D) momentum of *A* will remain constant

18. If *A* and *B* are connected to each other by an ideal string, then during all the possible collisions

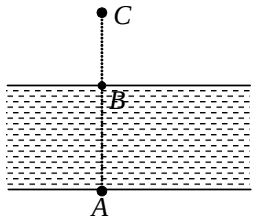
(A) momentum of *A* and *B* is conserved (B) momentum of *B* and *C* is conserved

(C) momentum of *B* and *C* is not conserved (D) momentum of *B* will remain constant

*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. 19 to 20

A river of width *d* is flowing with uniform velocity *u*. A boat starts moving from point *A* (one bank of river) with speed *u* relative to the river. The direction of resultant velocity is always perpendicular to line joining boat and fixed point *C* (see figure). Point *B* is on the opposite side of the river and *A*, *B*, *C* are in straight line. If *AB* = *BC* = *d*



19. The path of boat is

(A) straight line (B) parabolic

(C) circular (D) curve but not parabolic or circular

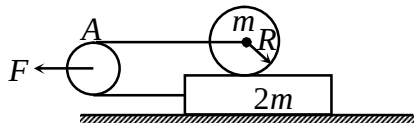
20. The distance from *B* where the boat will reach the other bank of river is

(A) d (B) $d\sqrt{2}$

(C) $\frac{d}{2}$ (D) $d\sqrt{3}$

Comprehension–2 for Q. No. 21 to 22

A solid cylinder of mass *m* and radius *R* is kept at rest on a plank of mass 2*m* lying on a smooth horizontal surface. Massless and inextensible string connecting cylinder to the plank is passing over a massless pulley. The friction between the cylinder and the plank is sufficient to prevent slipping. Pulley *A* is pulled with a constant horizontal force *F*.



21. Acceleration of cylinder with respect to earth is

(A) $\frac{5F}{21m}$ (B) $\frac{F}{7m}$

(C) $\frac{3F}{7m}$ (D) $\frac{2F}{7m}$

22. Acceleration of plank with respect to earth is

(A) $\frac{5F}{21m}$ (B) $\frac{F}{7m}$

(C) $\frac{3F}{7m}$ (D) $\frac{2F}{7m}$

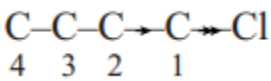
CHEMISTRY– (PART – H)

*This part contains **ONE (01)** comprehension**.** Based on comprehension, there are **THREE (03)** 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. 23 to 25

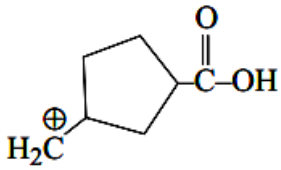
In a covalent single bond between unlike atoms, the electron pair forming the σ bond is never shared absolutely equally between the two atoms; it tends to be attracted a little more towards the more electronegative atom of the two. This is generally represented as

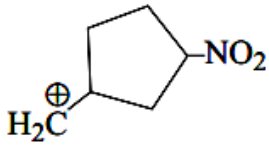
If the carbon atom bonded to chlorine is itself attached to further carbon atoms, the effect can be transmitted further as

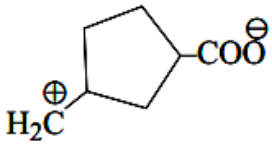


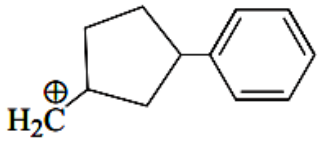
The effect of C_1 on C_2 is less than the effect of C_2 on C_3 ; however, the transmission quickly dies away in a saturated chain, usually being too small to be noticeable beyond C_2 . These influences on the electron distribution in σ bonds are known as inductive effects. Electron releasing groups w.r.t. the hydrogen atom are known to have +I effect and electron withdrawing groups are known to have –I effect. Electron donating group increases the stability of carbocation and withdrawing group increases the stability of carbanion.

23. Which of the following carbocation is expected to be most stable?

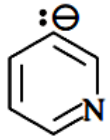
(A) 

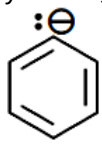
(B) 

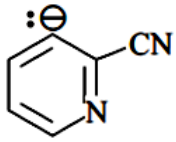
(C) 

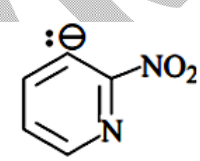
(D) 

24. Correct order of the stability of the given carbanion is

(i) 

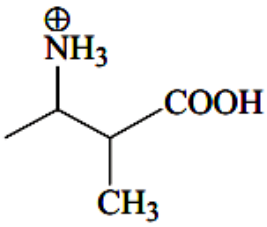
(ii) 

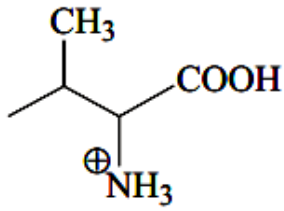
(iii) 

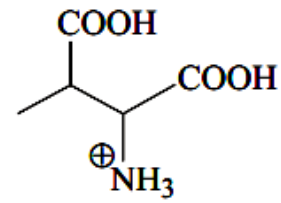
(iv) 

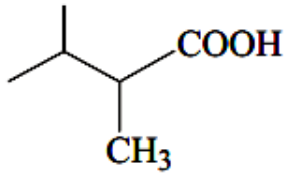
(A) i > ii > iii > iv
(B) ii > i > iii > iv
(C) iv > iii > ii > i
(D) iv > iii > i > ii

25. Most acidic compound in aqueous medium is

(A) 

(B) 

(C) 

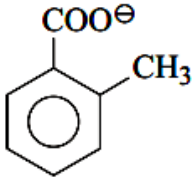
(D) 

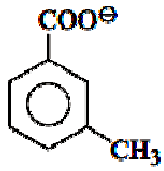
*This part contains **TWO (02)** comprehensions. Based on each comprehension, there are **TWO (02)** questions of **Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.*

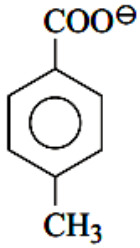
Comprehension–1 for Q. No. 26 to 27

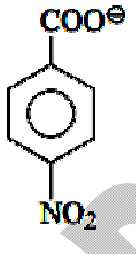
Benzoic acid is more acidic than acetic acid. Acidity of formic acid is more than the benzoic acid. Among monosubstituted benzoic acid derivatives, the ortho derivative is most acidic due to ortho effect. Acidity of any acid can be explained by the stability of conjugate base of the acid.

26. Which conjugate base is most stable?

(A) 

(B) 

(C) 

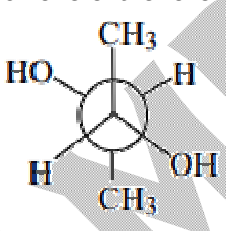
(D) 

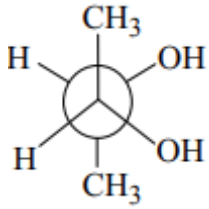
27. Arrange acidity of the given compounds increasing order
(i) p-nitrophenol (ii) p-fluorophenol (iii) p-chlorophenol
(A) (i), (ii), (iii) (B) (ii), (i), (iii)
(C) (ii), (iii), (i) (D) (iii), (ii), (i)

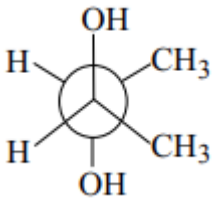
Comprehension–2 for Q. No. 28 to 29

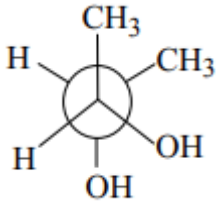
Different spatial arrangements of the atom that result from restricted rotation about a single bond are conformers. The general stability order of these conformer are as follows.
Anti > Gauche > Partially eclipsed > Fully eclipsed
Although anti is more stable than gauche but, in some cases, gauche is more stable than anti.

28. Which one of the following is the most stable conformer?

(A) 

(B) 

(C) 

(D) 

29. Number of possible stable conformers of butane is
(A) 2 (B) 4
(C) 6 (D) Infinite

MATHEMATICS – (PART – I)

*This part contains **ONE (01)** comprehension. Based on comprehension, there are **THREE (03)** 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. 30 to 32

If the locus of the circumcenter of a variable triangle having sides y axis, $y = 2$, and $lx + my = 1$, where (l, m) lies on parabola $y^2 = 4x$ is curve C, then

30. The length of smallest focal chord of curve C is

(A) $\frac{1}{4}$ (B) $\frac{1}{12}$

(C) $\frac{1}{8}$ (D) $\frac{1}{16}$

31. The curve C is symmetric about the line

(A) $x = \frac{3}{2}$ (B) $y = -\frac{3}{2}$

(C) $x = -\frac{3}{2}$ (D) $y = \frac{3}{2}$

32. If $A(\alpha, \beta)$ is the vertex of curve c. Then $\alpha + \beta$ is equal to

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

(C) $-\frac{5}{4}$ (D) $\frac{5}{4}$

*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. 33 to 34

If a, b, $c \in R$, satisfy the relation $a^2 = b^2 + c^2 - 2a + 6b - 4c + 14 = 0$.

33. The number of integers in the range of $f(x) = 2c \sin(x) - b \cos(x)$, are

(A) 10 (B) 11

(C) 12 (D) 13

34. The minimum value of $g(x) = a \cos^2(x) - b \sec^2(x) + 2c$, is

(A) $4 + 2\sqrt{3}$ (B) $4 - 2\sqrt{3}$

(C) 6 (D) 8

Comprehension–2 for Q. No. 35 to 36

Let the tangent at a point P on the hyperbola H, latus rectum at foci S and one of the asymptote is concurrent at a point 'A' such that $\frac{CA}{CB}=\frac{9}{4}$, where C is center of H and B is point of intersection of tangent at P to the other asymptote. Answer the following questions.

35. Let H : $ax^2+2hxy+by^2+2gx+2fy+c=0$ and length of transverse axis is 4 unit, then

(A) eccentricity of H is $\frac{9}{4}$ (B) eccentricity of H is $\frac{3}{2}$

(C) Radius of director circle is $2\sqrt{2}$ (D) Radius of director circle 4

36. Let H : $(x-1)^2-4(y-2)^2=4$ the slope of SP can be

(A) $\frac{3}{2}$ (B) $\frac{1}{2}$

(C) –2 (D) 2

FIITJEE

Diagnostic cum Scholarship Tests

SAMPLE PAPER

For Students of Class XII

Paper 3 JEE Advanced

Paper Code: 1112-3

ANSWER KEY

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