JEE-ADVANCE: TEST-14

TEST SERIES

PAPER-II

Time : 3 hrs. **M.M.: 180**

TEST CODE - A

TOPIC COVERED :

PHYSICS: Complete XI and XII Syllabus

CHEMISTRY: Complete XI and XII Syllabus

MATHEMATICS: Complete XI and XII Syllabus

ATTENTION: Kindly ask for the Roll No. from the invigilator to fill in OMR SHEET. Mark the Roll No. & Test code on the answer sheet properly. (No other sheet will be issued)

GENERAL INSTRUCTIONS :

1. The Test Paper consists of **60** questions

2. There are ***Three Subjects (Physics, Chemistry & Mathematics)*** in the question paper.

3. ***This paper is divided into 3 parts: Physics Section (I), (II) and (III); Chemistry Section (I), (II) and (III) & Mathematics Section (I), (II) and (III).***

- *Multiple correct answer type questions :* ***Physics Section (II) (1 to 8) Chemistry Section II (21 to 28) and Mathematics Section II (41 to 48), 3 marks*** *for each correct answer and* ***–1 mark*** *for incorrect answer.*
- *Linked Comprehension type questions:* ***Physics Section-II (9 to 16)*** *(4 comprehensions, with 2 questions);* ***Chemistry Section-II (29 to 36)*** *(4 comprehension, with 2 questions);* ***Mathematics Section- II (49 to 56)*** *(3 comprehension, with 3 and 2 questions)* ***3 marks*** *for each correct answer and* ***–1 mark*** *for incorrect answer.*
- *Match the following:* ***Physics Section-III (17 to 20); Chemistry Section-III (37 to 40) and Mathematics Section- IV (57 to 60) 3 marks*** *for each correct answer and* ***–1 mark*** *for incorrect answer.*

Name of the Student : _____

Section : _____

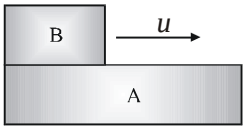
Centre : _____

Invigilator's Signature : _____

5. Two identical charged particles enter a uniform magnetic field with same speed but at angles 30° and 60° with field. Let *a*, *b* and *c* be the ratio of their time periods, radii and pitches of the helical paths than

(a) $abc = 1$ (b) $abc > 1$ (c) $abc < 1$ (d) $a = bc$

6. A long block A is at rest on a smooth horizontal surface. A small block B, whose mass is half of A, is placed on A at one end and projected along A with some velocity *u*. The coefficient of friction between the blocks is μ.



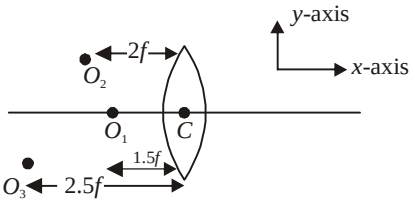
(a) The blocks will reach a final common velocity *u*/3.

(b) The work done against friction is two-thirds of the initial kinetic energy of B.

(c) Before the blocks reach a common velocity, the acceleration of A relative to B is (2/3)μg

(d) Before the blocks reach a common velocity the acceleration of A relative to B is (3/2)μg

7. Three objects O_1, O_2 and O_3 are placed in front of a convex lens as shown. The focal length of the lens is *f*. At the instant shown, O_1 has a velocity $V\hat{i}$, O_2 has a velocity $V\hat{j}$ and O_3 has a velocity $-V\hat{j}$. Select the correct alternative.



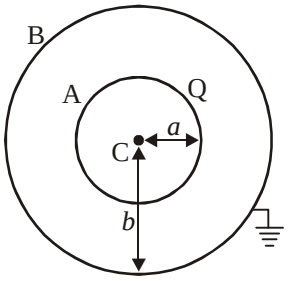
(a) Velocity of image of $O_1 = +4V\hat{i}$

(b) Velocity of image of $O_1 = +2V\hat{i}$

(c) Velocity of image of $O_2 = -V\hat{j}$

(d) Velocity of image of $O_3 = \frac{2}{3}V\hat{j}$

8. A conducting sphere A of radius *a*, with charge Q, is placed concentrically inside a conducting shell B of radius *b*. B is earthed. C is the common centre of A and B.



(a) The field at a distance *r* from C, where $a \le r \le b$, is $k\frac{Q}{r^2}$

(b) The potential at a distance *r* from C, where $a \le r \le b$, is $k\frac{Q}{r}$

(c) The potential difference between A and B is $kQ\left(\frac{1}{a} - \frac{1}{b}\right)$

(d) The potential at a distance *r* from C, where $a \le r \le b$, is $kQ\left(\frac{1}{r} - \frac{1}{b}\right)$

Supposing the current is given by equation (ii), we find the expression for the applied voltage as :

$$V_{app} = \omega L I_0 \cos\omega t - \frac{I_0}{\omega C}\cos\omega t$$

$$= \left(\omega L - \frac{1}{\omega C}\right) I_0 \cos\omega t \qquad \ldots(v)$$

In the above expression, we have ignored the integration constant from equation (iii).

The quantity, $X = \left[\omega L - \frac{1}{\omega C}\right]$, is the reactance of the circuit.

It depends on the frequency of the alternating current (or voltage).

Reactance is different from resistance in the sense that it does not dissipate energy in the form of heat.

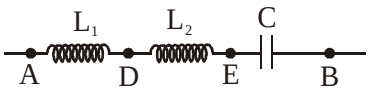
12. Reactance has units of

(a) ampere (b) mho (c) ohm (Ω) (d) henry-s or farad/s

13. If resistance is added to the circuit mentioned in the passage, the net reactance (X) at resonance in the circuit will be given by

(a) $X_{net} = X + R$ (b) $X_{net} = \sqrt{R^2 + X^2}$ (c) $X_{net} = X - R$ (d) $X_{net} = R$

14. An artificial 'voltage-divider' circuit is set up with two inductance and a capacitance.



An alternating voltage, $V = V_0 \cos(\omega t + \phi)$ is applied between A and B; and the output voltage is taken between A and D. The output voltage has a peak value

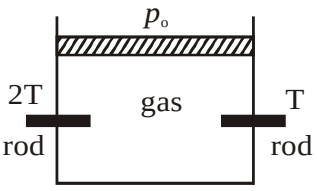
(a) $\frac{V_0 L_1}{L_1 + L_2}$ (b) $\frac{V_0 L_1}{\left|L_1 + L_2 - \frac{1}{\omega C}\right|}$

(c) $\frac{V_0 L_1}{\left|\frac{1}{\omega^2 C} - L_1 - L_2\right|}$, where | … | represents the absolute value.

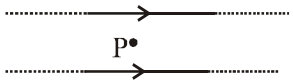
(d) which depends on the phase of the applied voltage (ϕ)

Paragraph for Question 15 to 16

Diagram shows an ideal gas contained in an insulated cylinder having an insulated piston of mass M on it. The heat transfer can only take place through the rods. The rods are in steady state. The ends of the rods in the gas have same temperature as the gas while the other ends are at constant temperature as shown in the figure. The rods are identical and conducting. [Given that atmospheric pressure is P_0].

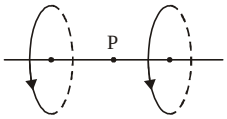


19. A. A point P is situated midway between the wires



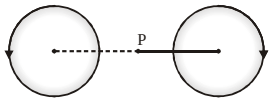
(p) The magnetic field (B) at P due to currents in wares are in the same direction.

B. Point P is situated at the mid point of the line joining the centres of the circular wires, which have same radii



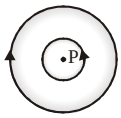
(q) The magnetic field (B) at P due to the currents in the wires are in opposite directions.

C. Point P is situated at the mid point of the line joining the centres of the circular wires, which have same radii.



(r) There is no magnetic field at P

D. Point P is situated at the common centre of the wire



(s) The wires repel each other

(a) A-(r),(s); B-(q); C-(r),(s); D-(r)
(b) A-(r),(s); B-(q); C-(p),(s); D-(q)
(c) A-(p),(r); B-(r); C-(p),(r); D-(s)
(d) A-(q),(r); B-(p); C-(q),(r); D-(q)

20. Column I gives certain situations in which a straight metallic wire of resistance *R* is used and Column II gives some resulting effects. Match the statements in Column I with the statements in Column II and indicate your answer by darkening appropriate bubbles in the 4 × 4 matrix given in the ORS.

A. A charged capacitor is connected to the ends of the wire
(p) A constant current flows through the wire

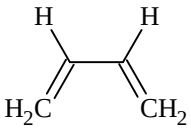
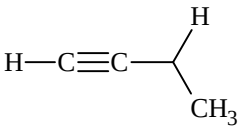
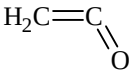
B. The wire is moved perpendicular to its length with a constant velocity in a uniform magnetic field perpendicular to the plane of motion
(q) Thermal energy is generated in the wire

C. The wire is placed in a constant electric field that has a direction along the length of the wire
(r) A constant potential difference develops between the ends of the wire

D. A battery of constant emf is connected to the ends of the wire
(s) Charges of constant magnitude appear at the ends of the wire

(a) A-(p); B-(q),(s); C-(r); D-(p),(q),(s)
(b) A-(s); B-(p),(q); C-(p); D-(p),(q),(r),(s)
(c) A-(q); B-(r),(s); C-(s); D-(p), (q), (r), (s)
(d) none of these

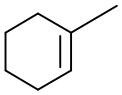
25. Amongst the given options, the compound(s) in which all the atoms are in one plane in all the possible conformations (if any), is(are):

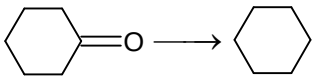
(a)  (b)  (c)  (d) none of these

26.  on ozonolysis gives:

(a) diketone (b) dialdehyde (c) pentane-1,5-dial (d) pentane-2,4-dione

27. Hydroboration oxidation and acid hydration will yield the same product in case of:

(a)  (b)  (c) $CH_2 = CH_2$ (d) $CH_3 - CH = CH - CH_3$

28. The reaction given below: 

is carried out by

(a) Wolff-Kishner reduction (b) P + HI

(c) Clemmensen reduction (d) $NaBH_4$

SECTION- II: PARAGRAPH TYPE

This Section contains **4 paragraphs** each describing theory, experiment, data etc. **Eight questions** relate to four paragraphs with two questions on each paragraph. Each question of a paragraph has **only one correct answer** amount the four choice (A), (B), (C) and (D).

Paragraph for Question 29 to 31

Although Bohr's atomic model is superior to Rutherford's Atomic Model, still it is suffering through some defects. Both are based on old classical concept of electronic motion. In both atomic models only particle nature of electrons were taken into account.

According to de-Broglie, "An electron behaves like a particle as well as a wave. Some of optical phenomenon like photoelectric effect, reflection of light are explained by considering particle nature of electron but some of optical phenomenon like diffraction, scattering, interference, polarisation are explained on the basis of wave nature of electron.

33. The compound B in the above problem is:

(a) 2-Bromopentane (b) Pent-2-yne

(c) 3-Bromopentane and 2-Bromopentane (d) None

34. The compound C in the above problem is:

(a) Pent-1-yne (b) Pent-2-yne (c) Pent-3-yne (d) Cyclopentene

Paragraph for Question 35 to 36

Compound (A), $C_6H_{12}O$, forms an oxime but gives a negative Fehling's test. When (A) is reduced with H_2 over a Pt catalyst, compound (B), $C_6H_{14}O$, is formed. Compound (B) is heated with conc. H_2SO_4 to form (C), C_6H_{12}. Compound (C), upon ozonolysis followed by hydrolysis, gives two compounds (D) and (E). Compound (D) gives a negative Tollen's test but a positive iodoform test. Compound (E) gives a positive Tollen's test and a negative iodoform test.

35. The Compound A in the above problem is

(a) 2-Methylpentan-3-one (b) 2-Methylpentan-1-one

(c) 3-Methylpentan-2-one (d) Hexan-3-one

36. The Compound B in the above problem is:

(a) 2-Methylpentan-2-ol (b) 4-Methylpentna-2-ol

(c) 2-Methylpentan-2-ol (d) 2-Methylpentan-3-ol

SECTION- III: MATCHING LIST TYPE

This Section contains **4 multiple choice questions**. Each question has matching lists. The codes for lists have choice (A), (B), (C) and (D) out of which **ONLY ONE** may be correct.

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37. A. Root mean square speed (p) $\propto \sqrt{T}$

B. Average speed (q) $\propto \sqrt{\frac{1}{M}}$

C. Most probable speed (r) $\propto \sqrt{\frac{1}{d}}$

D. Kinetic energy per mole (s) $\propto T$

(a) A-(p),(q),(r), B-(p),(q),(r), C-(p),(q),(r), D-(s)

(b) A-(p),(r),(s), B-(p),(q),(s), C-(q),(r),(s), D-(p),(s)

(c) A-(q),(r),(s), B-(r),(s), C-(p),(q),(r),(s), D-(p),(s)

(d) none of these

MATHEMATICS

SECTION- I: MULTIPLE CORRECT ANSWERS TYPE

This section contains 8 multiple choice questions numbered 41 to 48. Each question has 4 choice (A), (B), (C) and (D), out of which ONE OR MORE is/are correct

41. If $f : R \to R$, $f(x) = x + \ln(1 + x^2)$, then

(a) f is injective

(b) $\lim_{x \to -\infty} f(x) = +\infty$

(c) there is a point on the graph of $y = f(x)$ where tangent is not parallel to any of the chords

(d) f is bijective

42. If $\lim_{x \to 2} (\log_3 (ax^2 + 3x + 1))^{\log_{(x-1)} 3} = l$, where l is a finite real number then

(a) 'a' must be (-1) (b) 'a' can have more than one values

(c) $l = e^{-2/3}$ (d) $l = e^{-1/3}$

43. Let function $f(x)$, $x \neq 0$ be such that $f(x) + f\left(\frac{1}{x}\right) = f(x) \times f\left(\frac{1}{x}\right)$, then $f(x)$ can be

(a) $1 - x^{2013}$ (b) $\sqrt{|x|} + 1$ (c) $\frac{\pi}{2\tan^{-1}|x|}$ (d) $\frac{2}{1 + k\ln|x|}$

44. Let g be the inverse of the continuous function f. Let there be a point (α, β), where $\alpha \neq \beta$, such that it satisfies each of $y = f(x)$ and $y = g(x)$, then

(a) the equation $f(x) = g(x)$ has infinitely many solutions

(b) the equation $f(x) = g(x)$ has atleast 3 solutions

(c) f must be a decreasing function of x

(d) g can be an increasing function of x

45. Let $f(x) = \frac{ax^2 + bx + c}{bx^2 + ex + f}$. If $f(x)$ is not a constant function and both minimum and maximum values of $f(x)$ exist then

(a) $f(x)$ must be a continuous function (b) $4ac$ must be more then b^2

(c) $4fd$ must be more then e^2 (d) ae must not be equal to bd

53. Let P be a variable point on the ellipse with foci is S and S'. If Δ be the area of triangle PSS', then the maximum value of Δ is

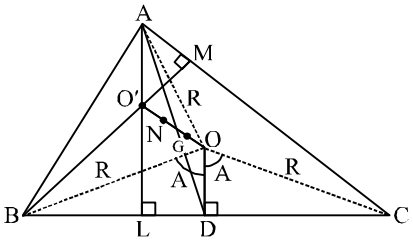
(a) $\sqrt{7}$ sq. unit (b) $2\sqrt{7}$ sq.unit (c) $3\sqrt{7}$ sq. unit (d) $4\sqrt{7}$ sq. unit

54. If mid point of A and B is (x_1, y_1) and slope of common tangent be m, then

(a) $2mx_1 + y_1 = 0$ (b) $2my_1 + x_1 = 0$ (c) $my_1 + x_1 = 0$ (d) $mx_1 + y_1 = 0$

Paragraph for Question 55 to 56

Let O, N, G and O' are the circumcentre, nine point centre, centroid and orthocentre of a ΔABC respectively. AL and BM are perpendiculars from A and B on sides BC and CA respectively. Let AD be the median and OD is perpendicular to side BC. Let R be the circum radius of ΔABC, then $OA = OB = OC = R$.



Now, in ΔOBD, $OD = R\cos A$, in ΔABM, AO' $= AM \sec(90° - C)$ (Q $\angle O'AM = 90° - C$)

$= AM \operatorname{cosec} C = \dfrac{C\cos A}{\sin C}$

$= 2R\cos A$

$\therefore$ $AO' = 2OD$

If S be any point in the plane of ΔABC and AP is the diameter of the circum circle.

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

55. $\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC}$ is equal to

(a) $\overrightarrow{OO'}$ (b) $2\overrightarrow{O'O}$ (c) $2\overrightarrow{AO}$ (d) $\overrightarrow{ON}$

56. $\overrightarrow{O'A} + \overrightarrow{O'B} + \overrightarrow{O'C}$ is equal to

(a) $\overrightarrow{OO'}$ (b) $2\overrightarrow{O'O}$ (c) $2\overrightarrow{AO'}$ (d) $2\overrightarrow{O'N}$

SECTION- III: MATCHING LIST TYPE

This Section contains **4 multiple choice questions**. Each question has matching lists. The codes for lists have choice (A), (B), (C) and (D) out of which **ONLY ONE** may be correct.

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57. Let V_r denote the sum of the first r terms of an A.P. whose first term is $2r - 1$ and common difference is 2.

$P_r = V_{r+1} - V_r$

$Q_r = P_1 + P_2 + ... + P_r$

$S_r = V_r - P_r$

$T_r = S_{r+1} - S_r$

Math the expression in Column I with corresponding properties conditions in Column II.

Column I	**Column II**
A. $x_r = P_r \forall r \geq 1$	(p) x_r is linear in r
B. $x_r = Q_r \forall r \geq 1$	(q) x_r is quadratic in r
C. $x_r = S_r \forall r \geq 1$	(r) x_r is cubic in r
D. $x_r = T_r \forall r \geq 1$	(s) x_r is independent of r

(a) A-(p); B-(q); C-(q); D-(p) (b) A-(q), B-(r), C-(p), D-(s)

(c) A-(s), B-(r), C-(p), D-(q) (d) A-(r), B-(p), C-(p), D-(q)

JEE-ADVANCE: TEST-14

TEST SERIES

PAPER-II

Time : 3 hrs. **M.M.: 180**

TEST CODE - A

ANSWERS

Physics: Section I to III

1	(a,b)	2.	(b,d)	3.	(a,d)	4.	(a,c,d)	5.	(a,d)	6.	(a,b,d)
7.	(a,c,d)	8.	(a,c,d)	9.	(a)	10.	(a)	11.	(d)	12.	(c)
13.	(d)	14.	(c)	15.	(a)	16.	(d)	17.	(a)	18.	(b)
19.	(d)	20.	(c)								

Chemistry: Section I to III

21.	(a,d)	22.	(a,b,d)	23.	(a,c)	24.	(a,c,d)	25.	(a,b)	26.	(b,c)
27.	(b,c,d)	28.	(a,b,c)	29.	(c)	30.	(c)	31.	(b)	32.	(b)
33.	(c)	34.	(b)	35.	(a)	36.	(d)	37.	(a)	38.	(b)
39.	(c)	40.	(d)								

Mathematics: Section I to III

41.	(a,c,d)	42.	(a,d)	43.	(a,b,c,d)	44.	(b,c)	45.	(a,c,d)	46.	(a,b,c)
47.	(b,c)	48.	(a,b,d)	49.	(c)	50.	(b)	51.	(c)	52.	(b)
53.	(c)	54.	(d)	55.	(a)	56.	(b)	57.	(a)	58.	(b)
59.	(c)	60.	(d)								