JEE-ADVANCE: TEST-4

TEST SERIES

PAPER-II

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

TEST CODE - A

TOPIC COVERED :

PHYSICS:	Magnetism, Optics, Alternating Current and Modern Physics
CHEMISTRY:	Ionic Equilibrium, Amines, Carbohydrates, Biomolecules, Polymers, Qualitative Analysis, Solid State and Metallurgy.
MATHEMATICS:	Trigonometry (TRI, TE, ST), Vector and 3-Dimensional Geometry.

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 : _____

PHYSICS

SECTION- I: MULTIPLE CORRECT ANSWERS TYPE

This section contains 8 multiple choice questions numbered 1 to 8. Each question has 4 choice (A), (B), (C) and (D), out of which ONE OR MORE is/are correct

1. An applied voltage signal is a mixture of d.c. voltage and an a.c. voltage of very high frequency. The circuit consists of an inductor L a resistance R and a capacitor C in series. Tick the incorrect statement.

(a) d.c. signal will appear across C and the a.c. signal will appear across L

(b) d.c. signal is bypassed by C and the a.c. signal is blocked by L

(c) both a.c. and d.c. signals are blocked by C

(d) C appears short to d.c. and L appears open to a.c.

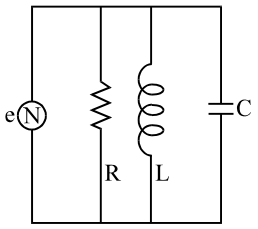
2. A parallel LCR current is shown at resonance, tick the incorrect statement

(a) The source current is maximum

(b) The circuit impedance is maximum and is independent of c.

(c) The resonant frequency has same magnitude as for a acceptor circuit having same values for L, C and R.

(d) Potential difference across L and C are in phase



3. White light is used to illuminate the two slits in a Young's double slit experiment. The separation between the slits is b and the screen is at a distance d ($>> b$) from the slits. At a point on the screen directly in front of one of the slits, certain wavelengths are missing. Some of these missing wavelengths are

(a) $\lambda = \frac{b^2}{d}$ (b) $\lambda = \frac{2b^2}{d}$ (c) $\lambda = \frac{b^2}{3d}$ (d) $\lambda = \frac{2b^2}{3d}$

4. The electron in a hydrogen atom makes a transition $n_1 \rightarrow n_2$, where n_1 and n_2 are the principal quantum numbers of two states. Assume the Bohr model to be valid. The time period of the electron in the initial state is eight times that in the final state. The possible values of n_1 and n_2 are

(a) $n_1 = 4, n_2 = 2$ (b) $n_1 = 8, n_2 = 2$ (c) $n_1 = 8, n_2 = 1$ (d) $n_1 = 6, n_2 = 3$

5. In a Young's double slit experiment, the separation between the two slits is d and the wavelength of the light is λ. The intensity of light falling on slit 1 is four times the intensity of light falling on slit 2. Choose the correct choice(s)

(a) If $d = \lambda$, the screen will contain only one maximum

(b) If $\lambda < d < 2\lambda$, at least one more maximum (besides the central maximum) will be observed on the screen

(c) If the intensity of light falling on slit 1 is reduced so that it becomes equal to that of slit 2, the intensities of the observed dark and bright fringes will increase

(d) If the intensity of light falling on slit 2 is increased so that it becomes equal to that of slit 1, the intensities of the observed dark and bright fringes will increase

6. In the Bohr model of the hydrogen atom

(a) the radius of the *n*th orbit is proportional n^2

(b) the total energy of the electron in the *n*th orbit is inversely proportional to *n*

(c) the angular momentum of the electron in an orbit is an integral multiple of h/π

(d) the magnetic of the potential energy of the electron in any orbit is greater than its kinetic energy

7. An electron in a hydrogen atom makes a transitions $n_1 \rightarrow n_2$ where n_1 and n_2 are principle quantum number of the two states. Assume the Bohr model to be valid. The time period of the electron in the initial state is eight times that in the final state. The possible value of n_1 and n_2 are

(a) $n_1 = 4, n_2 = 2$ (b) $n_1 = 8, n_2 = 2$ (c) $n_1 = 9, n_2 = 1$ (d) $n_1 = 6, n_2 = 3$

8. An electron in hydrogen atom first jumps from second excited state to first excited state and then from first excited state to ground state. Let the ratio of wavelength, momentum and energy of photons emitted in these two cases be a, b and c respectively. Then

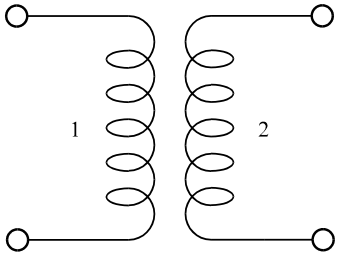
(a) c = 1/a (b) a = 9/4 (c) b = 5/27 (d) c = 5/27

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 9 to 10

Two coils made of Cu wires are placed very close together.



9. Which of the following operations will increase the flux linkage of coil (2) if a direct current i is flow in coil (1).

(a) Radius of coil (1) should be increased

(b) A rod of very high magnetic susceptibility should be inserted in coil (1)

(c) a rod of very low relative permeability should be inserted in coil (2)

(d) a rod of very high magnetic susceptibility should be inserted in coil (2)

10. The coefficient of coupling between coils (1) and (2) is 0.9. This means

(a) 90% of the total flux generated by coil (1) is linked with itself

(b) 10% of the total flux generated by coil (1) is linked with coil (2)

(c) 90% of the total flux generated by coil (1) is linked with coil (2)

(d) none of the above is correct

Paragraph for Question 11 to 12

When we solve the problems regarding position of image made by spherical mirrors, we use the formula $\frac{1}{v}+\frac{1}{u}=\frac{2}{R}$, u, v and R are the distances of object, image and centre of curvature of mirror. According to sign convention direction of incident ray is taken as positive direction and all the distances must be measured from pole. For image length we use the concept of lateral magnification. Which is $m=\frac{I}{O}=-\frac{v}{u}$. Where I and O are length of image and length of object respectively.

11. A car is fitted with a convex mirror of focal length 20 cm. A second car 2 m broad and 1.6 m high is 6 m away from the first car. The position of the second car as seen in the mirror of the first car is

(a) 19.35 cm (b) 17.45 cm (c) 21.48 cm (d) 15.49 cm

12. In the above question, the breadth and height of the second car seen in the mirror of the first car, are respectively

(a) 5.79 cm, 6.9 cm (b) 6.45 cm, 5.16 cm (c) 2.7 cm, 4.8 cm (d) 0.1 m, 0.3 m

Paragraph for Question 13 to 14

"Whenever a radioactive element X undergoes β^- decay, daughter nucleus Y is formed in excited state, which on transition to normal state releases γ – radiation according to reaction .

$$X \longrightarrow Y^+ + \beta^- + \Delta E_1$$

$$Y^+ \longrightarrow Y + \gamma \text{ rad} + \Delta E_2$$

here M_X and M_Y are the atomic masses of elements X and Y respectively and m_e is the mass of β particle".

13. The mass defect of the above decay is :

(a) $\Delta m^2 = M_X - M_Y - m_e$ (b) $\Delta m = M_X - M_Y - 2m_e$

(c) $\Delta m = M_X - M_Y$ (d) none of these

14. In first step the energy released ΔE_1 is :

(a) $\Delta E_1 = \Delta mc^2$ (b) $\Delta E_1 < \Delta mc^2$ (c) $\Delta E_1 > \Delta mc^2$ (d) none of these

Paragraph for Question 15 to 16

In a mixture of H – He^+ gas (He^+ is singly ionized He atom), H atoms and He^+ ions are excited to their respective first excited states. Subsequently, H atoms transfer their total excitation energy to He^+ ions (by collisions). Assume that the Bohr model of atom is exactly valid.

15. The quantum number *n* of the state finally populated in He^+ ions is

(a) 2 (b) 3 (c) 4 (d) 5

16. The wavelength of light emitted in the visible region by He^+ ions after collisions with H atoms is

(a) 6.5×10^{-5} m (b) 5.6×10^{-7} m (c) 4.8×10^{-7} m (d) 4.0×10^{-7} m

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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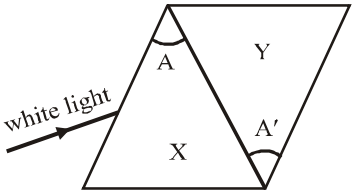
17. A prism 'X' and another 'Y' are kept in contact with their refracting angles placed opposite to each other as shown in the figure. White light is incident on the combination from the left. Column-I describes some situations. Match column-I with the possible outcomes given in column-II



A.	The prisms are made of same material and their refracting angles are equal, *i.e.*, A = A′. The combination will cause	(p)	Dispersion without deviation
B.	The prisms are made of same materials and their refracting angles are not equal, *i.e.*, A ≠ A′. The combination will cause	(q)	No deviation
C.	The prisms are made of different materials and their refracting angles are equal, *i.e.*, A=A′. Also the quantity $\mu_V - \mu_R$ has different values for the two prism. Here μ_V and μ_R are the refractive indices for violet and red colours. The combination will cause	(r)	No dispersion
D.	The prisms are made of different materials and their refracting angles are unequal, *i.e.*, A ≠ A′. Also $\frac{A}{A'}=\frac{(\mu'-1)}{(\mu-1)}$, where μ is the refractive index for the mean wavelength (yellow) for prism X while μ′ is the corresponding value for prism Y. The combination will cause	(s)	Both deviation and dispersion

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

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

18. Four physical quantities are listed in Column-I. Their values are listed in Column-II in a random order.

	Column-I		**Column-II**
A.	Thermal energy of air molecules at room temperature	(p)	0.02 eV
B.	Binding energy of heavy nuclei per nucleon	(q)	2 eV
C.	X-ray photon energy	(r)	10 KeV
D.	Photon energy of visible light	(s)	7 MeV

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

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

19.

A.	Radius of orbit is related with atomic number (Z)	(p) is proportional Z
B.	Current associated due to orbital motion electron with atomic number (Z)	(q) is inversely proportional Z
C.	Magnetic field at the centre due to orbital motion of electron related with Z	(r) is proportional to Z^2
D.	Velocity of an electron related with atomic number (Z)	(s) is proportional to Z^3

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

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

20.

A.	For square wave having peak value v_0	(p)	$v_0 > v_{rms} > v_{av}$
B.	For sinusoidal wave having peak value v_0	(q)	In a pure inductance.
C.	Current leads the voltage by $\pi/2$	(r)	$v_{av} = v_{rms} = v_0$
D.	Wattless current	(s)	In a pure capacitance

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

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

CHEMISTRY

SECTION- I: MULTIPLE CORRECT ANSWERS TYPE

This section contains 8 multiple choice questions numbered 21 to 28. Each question has 4 choice (A), (B), (C) and (D), out of which ONE OR MORE is/are correct

21. Which of the following are amphoteric oxides?

(a) Na_2O (b) BaO (c) Al_2O_3 (d) ZnO

22. Which of the following are acidic oxides?

(a) CO_2 (b) P_2O_3 (c) Mn_2O_7 (d) CrO_3

23. The solubility of a sparingly soluble salt A_xB_y in water at 25°C 1.4×10^{-4} M. The solubility product is 1.1×10^{-11}. The possibilities are

(a) $x = 1, y = 2$ (b) $x = 2, y = 1$ (c) $x = 1, y = 3$ (d) $x = 3, y = 1$

24. Which of the following will not an example of Buffer solution

(a) NH_4CN (b) HCN + KCN (c) $H_2CO_3 + NaHCO_3$ (d) $(NH_4)_2\ SO_4 + NH_4OH$

25. Which one is correct for the saturated solution of $Ca_3(PO_4)_2$ salt if its K_{sp} is 2.05×10^{-33}?

(a) Solubility of Ca_3PO_4 is 1.63×10^{-6} M (b) $[Ca^{2+}] = 4.9 \times 10^{-6}$ M

(c) $[PO_4^{3-}] = 3.26 \times 10^{-6}$ M (d) $[Ca_3(PO_4)_2]$ = constant

26. Which of the following acid-base reactions are possible?

(a) $PH_3 + NH_4^+ \longrightarrow PH_4^+ + NH_3$ (b) $NH_3 + PH_4^+ \longrightarrow NH_4^+ + PH_3$

(c) $(CH_3)_3\ P + NH_4^+ \longrightarrow (CH_3)_3\ P^+H + NH_3$ (d) $(CH_3)_3\ N + PH_4^+ \longrightarrow (CH_3)_3\ NH^+ + PH_3$

27. Which of the followign systems primitives $a \neq b \neq c$?

(a) Orthorhombic (b) Monoclinic (c) Triclinic (d) Hexagonal

28. Which of the following having their radius ratio between 0.414 to 0.732, *i.e.*, for NaCl structure have their radius ratio not in this range but possess NaCl type structure?

(a) LiBr (b) KCl (c) RbCl (d) BaO

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 30

p-Amino-*N, N*-dimethylaniline is added to a strongly acidic solution of **X**. The resulting solution is treated with a few drops of aqueous solution of **Y** to yield blue coloration due to the formation of methylene blue. Treatment of the aqueous solution of **Y** with the reagent potassium hexacyanoferrate (II) leads to the formation of an intense blue precipitate. The precipitate dissolves on excess addition of the reagent. Similarly, treatment of the solution of **Y** with the solution of potassium hexacyanoferrate (III) leads to a brown coloration due to the formation of **Z**.

29. The compound **X** is

(a) $NaNO_3$ (b) NaCl (c) Na_2SO_4 (d) Na_2S

30. The compound **Y** is

(a) $MgCl_2$ (b) $FeCl_2$ (c) $FeCl_3$ (d) $ZnCl_2$

Paragraph for Question 31 to 32

K_b of CH_3COO^- is 5.26×10^{-10}. Calculate for 0.01 N solution of sodium acetate.

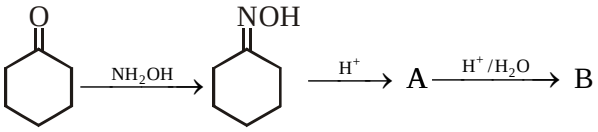
31. Hydrolysis constant of CH_3COO^- is

(a) 5.26×10^{-10} (b) 5.26×10^{-11} (c) 5.26×10^{-12} (d) 5.26×10^{-9}

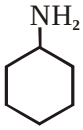
32. Degree of hydrolysis of CH_3COO^- is

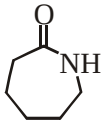
(a) 2.29×10^{-6} (b) 2.29×10^{-4} (c) 2.29×10^{-3} (d) 2.29×10^{-5}

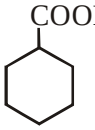
Paragraph for Question 33 to 34

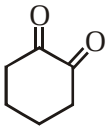


33. Compound 'A' is

(a) 

(b) 

(c) 

(d) 

34. When 'B' undergoes polymerisation, the substance obtained is:

(a) Nylon-6 (b) Nylon-66 (c) Nylon-610 (d) Terylene-6

Paragraph for Question 35 to 36

For the purpose of systematic qualitative analysis, cations are classified into various groups on the basis of their behaviour against some reagent. The group reagents used for the classification of most common cations are hydrochloric acid, hydrogen sulphide, ammonium hydroxide, and ammonium carbonate.

Classification is based on whether a cation reacts with these reagents by the formation of precipitates or not.

35. Which one among the fallowing pairs of ions cannot be separated by H_2S in presence of dilute hydrochloric acid?

(a) Bi^{3+}, Cd^{2+} (b) Al^{3+}, Hg^{2+} (c) Zn^{2+}, Cu^{2+} (d) Ni^{2+}, Cu^{2+}

36. An aqueous solution contains Hg^{2+}, Hg_2^{2-}, Pb^{2+} and Cd^{2+}. The addition of 2M HCl will precipitate.

(a) $HgCl_2$ only (b) $PbCl_2$ only (c) $PbCl_2$ and Hg_2Cl_2 (d) $PbCl_2$ and $CdCl_2$

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.

37.

A.	pK_b of X^- (K_a of HX = 10^{-6})	(p)	6.9
B.	pH of 10^{-8} M HCl	(q)	8
C.	pH of 10^{-2} M acetic acid solution (Take K_a of acetic acid = 1.6×10^{-5})	(r)	3.3
D.	pH of solution obtained by mixing equal volumes of solutions with pH 3 and 5. (log 2 = 0.3010, log 3 = 0.4771, log 4 = 0.6020, log 5 = 0.6990)	(s)	3.4

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

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

38. Match the colour of precipitates listed in column (I) with the reagent(s) listed in column (II).

	Column-I		**Column-II**
A.	Bi^{3+} gives black precipitate with	(p)	Saturated solution of H_2S in water
B.	Cu^{2+} gives black precipitate with	(q)	Potassium thiocyanate solution
C.	Zn^{2+} gives white precipitate with	(r)	Potassium iodide solution
D.	Ag^+ gives white precipitate with	(s)	Potassium ferrocyanides solution.

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

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

39. A. Natural rubber (p) Thermosetting polymer
B. Nylon-66 (q) Homopolymer
C. Bakelite (r) Butadiene and styrene
D. Buna-S (s) Polyamide
(t) Copolymer

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

40. **Column-I (Functional group)** **Column-II (Reagent)**
A. –COOH (p) $FeCl_3$
B. $-CONH_2$ (q) NaOH
C. $-NH_2$ (r) HNO_2
D. $-C=\overset{\overset{OH}{|}}{C}-$ (s) $NaHCO_3$
(a) A-(q), B-(p), C-(p), D-(r) (b) A-(q), B-(r), C-(p), D-(s)
(c) A-(s), B-(r), C-(p), D-(q) (d) A-(s), B-(q),(r), C-(r), D-(p)

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. The line whose vector equations are $\vec{r} = 2\hat{i} + 3\hat{j} + 7\hat{k} + \lambda(2\hat{i} + p\hat{j} + 5\hat{k})$ and $\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \mu(3\hat{i} - p\hat{j} + p\hat{k})$ are perpendicular for all values of λ and μ if p =

(a) –1 (b) 2 (c) 5 (d) 6

42. The vectors $\lambda\hat{i} + \hat{j} + 2\hat{k}, \hat{i} + \lambda\hat{j} - \hat{k}$ and $2\hat{i} - \hat{j} + \lambda\hat{k}$ are coplanar if

(a) $\lambda = -2$ (b) $\lambda = 1 + \sqrt{3}$ (c) $\lambda = 1 - \sqrt{3}$ (d) $\lambda = 0$

43. Let $0 \le A, B \le \frac{\pi}{2}$ satisfying the equation $3\sin^2 A + 2\sin^2 B = 1$ and $3\sin 2A - 2\sin 2B = 0$, then $A + 2B$ is

(a) $\frac{\pi}{2}$ (b) $\frac{3\pi}{2}$ (c) π (d) $\frac{\pi}{4}$

44. If $f(x) = \cos(\cos x)$, $x \in R$, then

(a) $\min f(x) = -1$ (b) $\min f(x) = \cos 1$ (c) $\max f(x) = 1$ (d) $\max f(x) = \cos 1$

45. If $\sin\beta$ is the G.M. between $\sin\alpha$ and $\cos\alpha$, then $\cos 2\beta$ is equal to

(a) $2\sin^2\left(\frac{\pi}{4} - \alpha\right)$ (b) $2\cos^2\left(\frac{\pi}{4} - \alpha\right)$ (c) $2\cos^2\left(\frac{\pi}{4} + \alpha\right)$ (d) $2\sin^2\left(\frac{\pi}{4} + \alpha\right)$

46. If the non-zero vector $\vec{a}$ and $\vec{b}$ are perpendicular to each other and $\vec{r} \times \vec{a} = \vec{b}$ then

(a) $\vec{r} = x\vec{a} + \frac{1}{\vec{a}.\vec{a}}(\vec{a} \times \vec{b})$ (b) $\vec{r} = x\vec{b} + \frac{1}{\vec{b}.\vec{b}}(\vec{a} \times \vec{b})$
(c) $\vec{r} = x\vec{a} \times \vec{b}$ (d) $\vec{a}.\vec{b} = 0$

47. The point of intersection of lines $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-5}{5}$ and $\frac{x-5}{2}=\frac{y-7}{3}=\frac{z-10}{4}$ lies on plane

(a) $x + y - z = 2$ (b) $2x + y - z = 7$ (c) $x + y + z = 22$ (d) $x + 2y + z = 7$

48. The coordinate of a point on the line $\frac{x-1}{2}=\frac{y+1}{-3}=z$ at a distance $4\sqrt{14}$ from the point (1, –1, 0) are

(a) (9, –13, 4) (b) $(8\sqrt{14}+1, -12\sqrt{14}-1, 4\sqrt{14})$

(c) (–7, 11, –4) (d) $(-8\sqrt{14}+1, 12\sqrt{14}-1, -4\sqrt{14})$

SECTION- II: PARAGRAPH TYPE

This Section contains **3 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** amont the four choice (A), (B), (C) and (D).

Paragraph for Question 49 to 50

$$L: \frac{x+1}{2}=\frac{y+1}{3}=\frac{z+1}{4}$$

$$\pi_1 : x + 2y + 3z = 14,\ \pi_2 : 2x - y + 3z = 27$$

49. If the line L meets the plane π_1 in the point P, and the coordinates of P are (α, β, γ) then $\alpha^2 + \beta^2 + \gamma^2$ is equal to

(a) 3 (b) 14 (c) 28 (d) 29

50. The line through P perpendicular to the plane π_1 passes through the point

(a) (1, 1, 1) (b) (0, 1, 0) (c) (0, 0, 0) (d) (0, 0, 1)

Paragraph for Question 51 to 52

A triangle ABC is inscribed in a circle D, E, F are the middle points of the sides BC, CA and AB respectively, $\angle CAD = \theta$. AD produced meets the circle at L. AD = x, BD = y.

51. Area of the ΔABC is equal to

(a) $xy \cos(\theta + C)$ (b) $(x + y)\sin\theta$ (c) $xy \sin(\theta + C)$ (d) $(1/2)\, xy \sin(\theta + C)$

52. $\sin\theta + \sin(A - \theta) + \sin(B + C)$ is equal to

(a) $4 \sin A \sin B \sin C$ (b) $4 \cos(\theta/2) \cos((A - \theta)/2) \cos((B + C)/2)$

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

Paragraph for Question 53 to 54

Consider the equations

$5\sin^2 x + 3 \sin x \cos x - 3 \cos^2 x = 2$ ...(i)

$\sin^2 x - \cos 2x = 2 - \sin 2x$ ...(ii)

53. If $\tan\alpha$, $\tan\beta$ satisfy (1) and $\cos\gamma$, $\cos\delta$ satisfy (2), then $\tan\alpha \tan\beta + \cos\gamma + \cos\delta$ can be equal to

(a) -1 (b) $-\frac{5}{3}+\frac{2}{\sqrt{13}}$ (c) $\frac{5}{3}-\frac{2}{\sqrt{13}}$ (d) none of these

54. The number of solutions common to (1) and (2) is

(a) 0 (b) 1 (c) infinite (d) none of these

Paragraph for Question 55 to 56

Let $\hat{x},\hat{y},\hat{z}$ be the vector, such that $|\vec{x}|=|\vec{y}|=|\vec{z}|=\sqrt{2}$ and $\hat{x},\hat{y},\hat{z}$ makes angle 60° with each other. $\hat{x}\times(\hat{y}\times\hat{z})=\hat{a}$, $\vec{y}\times(\vec{z}\times\vec{x})=\hat{b}$ and $(\hat{x}\times\hat{y})=\hat{c}$. Then

55. The value of $\hat{x}$ is

(a) $\frac{1}{2}\{(\vec{a}+\vec{b})\times\vec{c}-(\vec{a}+\vec{b})\}$ (b) $\{(\vec{a}+\hat{b})\times\vec{c}-(\vec{a}+\hat{b})\}$

(c) $\{(\vec{a}+\hat{b})-(\vec{a}+\hat{b})\times\vec{c}\}$ (d) none of these

56. The value of $\hat{y}$ is

(a) $2\{(\vec{a}+\hat{b})+(\vec{a}+\hat{b})\times\vec{c}\}$ (b) $\frac{1}{2}\{(\vec{a}+\vec{b})+(\vec{a}+\vec{b})\times\vec{c}\}$

(c) $4\{(\vec{a}+\hat{b})+(\vec{a}+\hat{b})\times\vec{c}\}$ (d) none of these

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. $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$

A.	Point on the line at a distance $10\sqrt{2}$ from (2, 3, 4)	(p)	(–1, –1, –1)
B.	Point on the line common to the plane $x + y + z + 3 = 0$	(q)	(2, 3, 4)
C.	Point on the line at a distance $\sqrt{29}$ from the origin	(r)	(8, 11, 14)
D.	Point on the line common to the plane $x + y - z + 3 = 0$	(s)	(–4, –5, –6)

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

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

58. ABC is a triangle in which $\cos(A-B)=\frac{4}{5}$ and BC = 6, AC = 3. AD is the median through A, $\angle BAD=\alpha$, CL is perpendicular to AD.

	Column I	**Column II**
A.	The value of $\sin\alpha$ is	(p) $\frac{3\sqrt{5}}{2}$
B.	Length of the median AD is	(q) $\frac{1}{\sqrt{10}}$
C.	Radius of circumcircle of the triangle ABC is	(r) $3\sqrt{2}$
D.	The value of $\cot\angle ADC$ is	(s) 1

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

59.

A.	Value of $\cos\frac{\pi}{7}+\cos\frac{3\pi}{7}+\cos\frac{5\pi}{7}$ is	(p)	$-\frac{1}{8}$
B.	$\cos\frac{\pi}{7}.\cos\frac{3\pi}{7}.\cos\frac{5\pi}{7}$ is	(q)	$\frac{1}{2}$
C.	$\tan9^\circ-\tan27^\circ-\tan63^\circ+\tan81^\circ$	(r)	1
D.	If $0<\beta<\alpha<\frac{\pi}{4}$, $\cos(\alpha+\beta)=\frac{3}{5}$ and $\cos(\alpha-\beta)=\frac{4}{5}$, then $\sin2\alpha$ is	(s)	4
		(t)	$\frac{1}{16}$

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

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

60.

A.	The possible value of a if $\vec{r}=(\hat{i}+\hat{j})+\lambda(\hat{i}+2\hat{j}-\hat{k})$ and $\vec{r}=(\hat{i}+2\hat{j})+\mu(-\hat{i}+\hat{j}+a\hat{k})$ are two skew lines	(p)	-4
B.	The angle between the vectors $\vec{a}=\lambda\hat{i}-3\hat{j}-\hat{k}$ and $\vec{b}=2\lambda\hat{i}+\lambda\hat{j}-\hat{k}$ is acute, where as the vector $\vec{b}$ makes with axes of coordinate an obtuse angle, then λ may be	(q)	-2
C.	The possible value of a such that $(2\hat{i}-\hat{j}+\hat{k})$, $\hat{i}+2\hat{j}+(1+a)\hat{k}$ and $(3\hat{i}+a\hat{j}+5\hat{k})$ are coplanar is	(r)	2
D.	If $\vec{A}=2\hat{i}+\lambda\hat{j}+3\hat{k}, \vec{B}=2\hat{i}+\lambda\hat{j}+\hat{k}$, $\vec{C}=3\hat{i}+\hat{j}$ and $\vec{A}+\lambda\vec{B}$ is perpendicular of $\vec{C}$, then $\lvert2\lambda\rvert$ is	(s)	3
		(t)	1

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

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

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

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

JEE-ADVANCE: TEST-4

TEST SERIES

PAPER-I

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

TEST CODE - A

ANSWERS

Physics: Section I to II

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

Chemistry: Section I to II

16.	(d)	17.	(d)	18.	(a)	19.	(b)	20.	(a)	21.	(b)
22.	(d)	23.	(b)	24.	(c)	25.	(d)	26.	(a,b,c,d)	27.	(b,c)
28.	(b,c,d)	29.	(a,b,c,d)	30.	(a,b,c,d)						

Mathematics: Section I to II

31.	(b)	32.	(c)	33.	(a)	34.	(d)	35.	(a)	36.	(d)
37.	(a)	38.	(c)	39.	(b)	40.	(c)	41.	(c,d)	42.	(b,c)
43.	(a,c)	44.	(a,b,c,d)	45.	(a,b,c,d)						

Section-III (PCM)

1	(5)	2.	(6)	3.	(5)	4.	(9)	5.	(3)	6.	(3)
7.	(6)	8.	(2)	9.	(3)	10.	(6)	11.	(2)	12.	(1)
13.	(3)	14.	(6)	15.	(7)						

JEE-ADVANCE: TEST-4

TEST SERIES

PAPER-II

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

TEST CODE - A

ANSWERS

Physics: Section I to III

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

Chemistry: Section I to III

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

Mathematics: Section I to III

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