JEE-ADVANCE: TEST-3

PAPER-II

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

TEST CODE - A

TOPIC COVERED :

PHYSICS: Complete Syllabus

CHEMISTRY: Complete Syllabus

MATHEMATICS: Complete 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 : _____

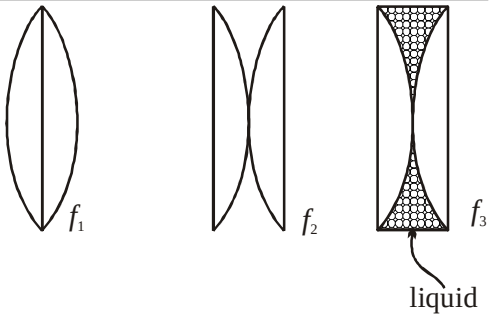
Invigilator's Signature : _____

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. The following figure shows different arrangements of two identical pieces of thin plano-convex lenses. The refractive index of the liquid used is less than that of the glass. The effective local lengths in the three cases are related as



(a) $f_1 = f_2 > f_3$ (b) $f_1 \neq f_2 \neq f_3$

(c) $f_1 = f_2 < f_3$ (d) $f_1 = f_2 = f_3$

2. The magnitude of focal length of a concave mirror is f. An object is placed at a distance x from the focus and forms a real image. The magnification is

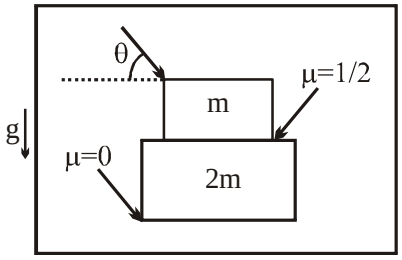
(a) $-f/x$ (b) $-x/f$ (c) $-f/(f-x)$ (d) $x/(x-f)$

3. 3 spheres A, B and C having radii R, 2R and 3R respectively are coated with carbon black on their surfaces. The wavelengths corresponding to maximum intensity are 3000Å, 4000Å and 5000Å respectively. The power radiated by them are Q_A, Q_B and Q_C.

(a) Q_A is maximum among all (b) Q_B is maximum among all

(c) Q_C is maximum among all (d) $Q_A = Q_B = Q_C$

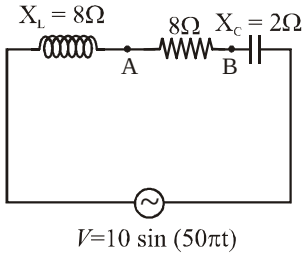
4. Inside a lift moving vertically downwards with an acceleration g, two blocks of mass m and $2m$ are placed as shown in the figure. The top block is given a sharp hit at an angle θ so as to move it. What is the value of θ for which both the blocks move together without sliding on each other



(a) $\theta < 53°$ (b) $\theta < 37°$

(c) $\theta > 53°$ (d) $\theta > 37°$

5. The instaneous potential difference between points. A and B is



(a) $8\sin(50\pi t + 37\frac{\pi}{180})$ (b) $8\sin(50\pi t - 37\frac{\pi}{180})$

(c) $10\sin(50\pi t)$ (d) $10\cos(50\pi t)$

6. A convex lens forms a real image with magnification m_1 on a screen. Now, the screen is moved by a distance x and the object is also moved so as to obtain a real image with magnification m_2 ($< m_1$) on the screen. Then,

(a) $\left(\frac{m_1}{m_2}\right)x$ (b) $\left(\frac{m_2}{m_1}\right)x$ (c) $x\,(m_2 - m_1)$ (d) $\frac{x}{(m_2 - m_1)}$

7. The Schrodinger equation for a free electron of mass m and energy E written in terms of the wave function Ψ is $\frac{d^2\psi}{dx^2} + \frac{8\pi^2 mE}{h^2}\psi = 0$. The dimensions of the coefficient Ψ of in the second term must be

(a) $[M^1\ L^1]$ (b) $[L^2]$ (c) $[L^{-2}]$ (d) $[M^1L^{-1}T^1]$

8. A ball falls vertically onto a floor with momentum p, and then bounces repeatedly. If the coefficient of restitution is e then the total momentum imparted by the ball on the floor is

(a) $p(1+e)$ (b) $\frac{p}{1-e}$ (c) $p\left(1+\frac{1}{e}\right)$ (d) $p\left(\frac{1+e}{1-e}\right)$

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 11

In a flexible balloon, 2 moles of SO_2 having initial volume of 1 kJ at a temperature of 27°C is filled (SO_2 is a linear triatomic gas). The gas is first expanded to thrice its initial volume isobarically and then expanded adiabatically so as to attain its initial temperature. Assuming gas is ideal and $R = \frac{25}{3}$ J mol^{-1} K^{-1}.

9. Change in internal energy of the gas in the isobaric process is

(a) 2.5×10^4 J (b) 1.2×10^6 J (c) 3×10^5 J (d) 0.5×10^3 J

10. Work done by the gas in the whole process is

(a) 2 kJ (b) 3.2 kJ (c) 35 kJ (d) 15 kJ

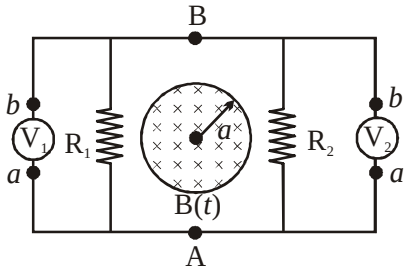
11. Net heat released by the system

(a) positive (b) negative

(c) zero (d) cannot be decided with given information

Paragraph for Question 12 to 14

The circuit shown in the figure consists of two resistance R_1 and R_2 connected to two ideal voltmeters V_1 and V_2. Assume that a voltmeter reads $\Delta V = -\int_a^b \vec{E}.d\vec{l}$ between its terminals. A time varying magnetic field B(t) exists in a circular region of radius a and it is directed into the plane of the figure B(t) = $B_o t$ where B_o is a positive constant of proper dimensions and t is the time



12. The emf induced in the circuit is

(a) $2\pi a^2 B_o$ (b) $\pi a^2 B_o$ (c) $\frac{a^2 B_o}{2}$ (d) $\frac{\pi a^2 B_o}{2}$

13. The reading of V_1 is

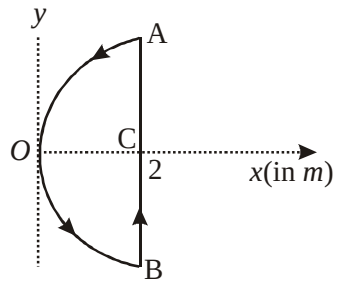
(a) $\pi a^2 B_0$ (b) $\frac{\pi a^2 B_0 R_1}{R_2}$ (c) $\frac{\pi a^2 B_0 R_1}{R_1 + R_2}$ (d) $\frac{-\pi a^2 B_0 R_1}{R_1 + R_2}$

14. The reading of V_2 is

(a) $\frac{-\pi a^2 B_0 R_1}{R_1 + R_2}$ (b) $\frac{-\pi a^2 B_0 R_2}{R_1 + R_2}$ (c) $\frac{\pi a^2 B_0 R_1}{R_1 + R_2}$ (d) none of these

Paragraph for Question 15 to 16

A conducting wire is bend into a loop as shown in the figure. The segment AOB is parabolic given by the equation $y^2 = 2x$ while segment BA is a straight line $x = 2$. The magnetic field in the region $\vec{B} = -8\hat{k}$ tesla and the current in wire is 2A



15. The torque on the loop will be

(a) $16\sqrt{2}$N – m (b) 16 N – m (c) $18\sqrt{2}$N – m (d) zero

16. The field created by the current in the loop at point C will be

(a) $-\frac{\mu_0}{4\pi}\hat{k}$ (b) $-\frac{\mu_0}{8\pi}\hat{k}$ (c) $-\frac{\mu_0\sqrt{2}}{\pi}\hat{k}$ (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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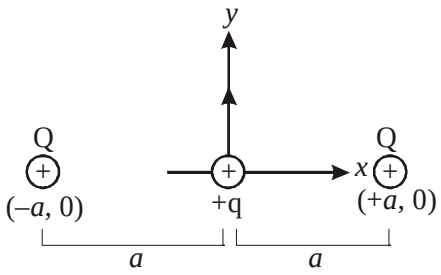
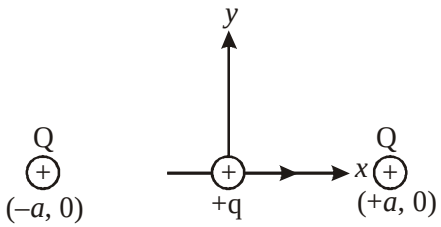
17. In column-I some equilibrium or non-equilibrium state are given match with column-II in which charged +Q and –Q are fixed why charge q or –q movable point charge shown in figure. Match the correct options

A. Unstable equilibrium

(p) 

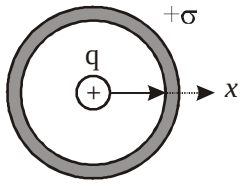
Equilibrium in y-direction

B. accelerating (non-equilibrium)

(q) 

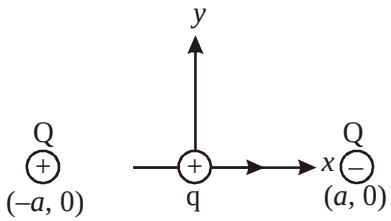
Equilibrium in x-direction

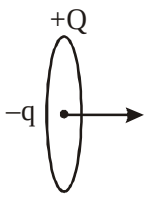
C. stable equilibrium

(r) 

equilibrium in x-direction (system consist of a uniformly charged fixed nonconducting spherical shell and neglect effect of induction)

D. neutral equilibrium

(s) 

(t) 

(A uniformly charged fixed ring) Equilibrium of –q charge in given direction.

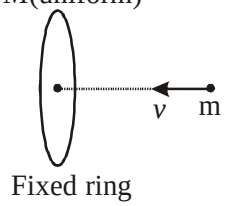
(a) A-(p); B-(s); C-(q)(t); D-(r)

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

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

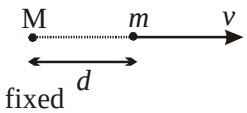
(d) none of these

18. Column-I has some statements about the system shown in column -II, Match appropriate column

A. 

[Neglect other gravitational forces, system consists of ring and point mass]

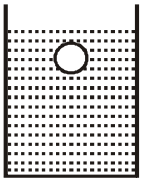
(p) Kinetic energy of system continuously decreases.

B. 

$v > \sqrt{\frac{2GM}{d}}$

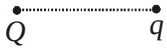
[Neglect other gravitational force, system consists of two point massage M and m]

(q) Kinetic energy of system continuously increases.

C. 
$\rho_{ball} > \rho_{liquid}$

'liquid' is viscous and filled in a very long tube.

(r) Potential energy of system continuously increases.

D. 

both the charges are free to move and release from rest

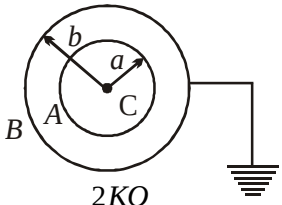
(s) Total mechanical energy of system remains conserved

(t) Total mechanical energy of system continuously decreases.

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

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

19. A conducting sphere A of radius a, with change Q is placed concentrically inside a conducting shell B of radius *b*. B is earthed, C is the common centre of A and B. If P is the point between shells A & B at distance *r* from centre C then for (a = 1m, b = 3m and r = 2 m)



A. Electric field at point P is (p) $\frac{2KQ}{3}$

B. Electric potential at point P is ($V_\infty = 0$) (q) zero

C. Electric potential difference between A and B is (r) $\frac{KQ}{4}$

D. Electric field outside the shell B at distance 5 m from centre C is (s) $\frac{KQ}{6}$

(t) $\frac{KQ}{15}$

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

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

20. An ideal monoatomic gas is subjected to the processes mentioned in Column-I, Column-II mentions some values of molar specific heat capacity. Match the process in column-I to its corresponding molar specific heat capacity in Column-II.

A. $\frac{V}{T^2}$ = constant	(p) $\frac{9}{2}R$
B. $\frac{V}{T^3}$ = constant	(q) $\frac{3}{2}R$
C. PT^2 = constant	(r) $\frac{11}{2}R$
D. PT^3 = constant	(s) $\frac{7}{2}R$
	(t) R

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

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

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. Anhydrous barium nitrate and magnesium nitrate both decompose on heating, evolving nitrogen dioxide and oxygen and forming an oxide. Choose the correct statement about this decomposition.

(a) Nitrogen dioxide is evolved at a lower temperature from magnesium nitrate than from barium nitrate.

(b) Nitrogen dioxide is evolved at a lower temperature from barium nitrate than from magnesium nitrate.

(c) For both nitrates the volume of nitrogen dioxide evolved is four times greater than the volume of oxygen.

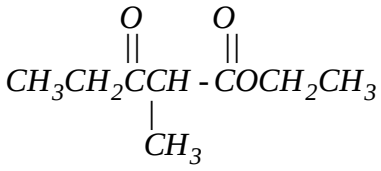
(d) The numerical value of the lattice energy of magnesium nitrate is greater than that of barium nitrate.

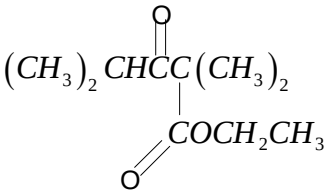
22. Which of the following factors to be considered for the stability of half filled and fully filled orbital

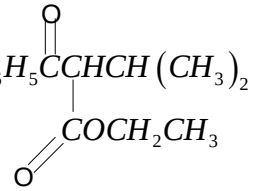
(a) Exchange energy (b) Symmetrical distribution of electrons

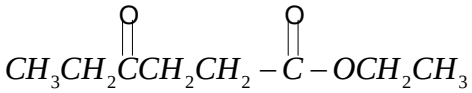
(c) Shape of orbital (d) valence electrons

23. Which of the following keto esters is/are not likely to have been prepared by a Claisen condensate

(a) 

(b) 

(c) 

(d) 

24. Which of the following is/are correct :

(a) Ionization energy of N is greater than ionization energy of oxygen

(b) Hydrogen bond is stronger bond than van der waal's force of attraction

(c) The value of electron affinity can depend on electronic configuration.

(d) Ionic bond formation depends on lattice energy

25. CO_2 is isostructural (same structure) with

(a) C_2H_2 (b) $BeCl_2$ (c) PCl_5 (d) ClF_3

26. In which of the following compounds central atom has two lone pair of electrons

(a) ClF_3 (b) BrF_3 (c) XeF_2 (d) I_3^-

27. Which of the following is/are correct:

(a) Electron affinity of Inert gas can be considered as almost zero

(b) According to valence bond theory O_2 is diamagnetic but molecular orbital theory explains about para-magnetic behaviour of O_2

(c) As shielding effect increases ionization energy decreases

(d) The order of ionization energy of s > p > d > f orbitals/ sub-shells in same shell is

28. Which of the following is/are correct:

(a) Covalent radii is greater than van der waal radii

(b) Covalent radii is lesser than van der waal radii

(c) the atomic size of neon is greater than fluorine

(d) electron affinity of chlorine is greater than fluorine

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

Buffer solutions are those which resist change in pH upon addition of small amount of acid or base. There are two type of buffers (i) simple buffer and (ii) mixed buffer. Simple buffer is salt of weak acid and weak base and its pH is found using the concept of hydrolysis. Mixed buffer is of two types acidic buffer and basic buffer. Acidic buffer is mixture of weak acid and its salt with a strong base.

Basic buffer is a mixture of weak base and its salt with strong acid. The reason a buffer is able to resist change in pH is because on adding H^+ the solution consumes it to produce weak acid, and on adding OH , the solution produces weak base. pH and pOH of acidic and basic buffer solution are found using the expression (i) and (ii) respectively

$$pH = pka + \log\frac{[salt]}{[acid]} \quad .....(i)$$

$$pOH = pk_b + \log\frac{[salt]}{[base]} \quad ..... (ii)$$

Buffer capacity, β, is defined as the amount of a strong acid or strong base required to change the pH of a buffer solution by one unit.

$$\beta = \frac{dx}{d\Delta pH}$$

If in case mixture is not buffer. It may be case of salt hydrolysis.

29. A certain buffer solution contains equal concentration of X^- and HX. k_b for X is 10^{-10}. pH of buffer is

(a) 3 (b) 4 (c) 5 (d) 10

30. The pH of a solution obtained by mixing 50 ml of 0.1 M CH_3COOH with 10 ml of 0.1 M NaOH, is [k_a of $CH_3COOH = 2 \times 10^{-5}$, log2 = 0.301, log5 = 0.699]

(a) 5.0 (b) 4.1 (c) 6.01 (d) 4.5

Paragraph for Question 31 to 32

A chemist opened a cupboard to find four bottles containing water solutions, each of which has lost its label. Bottle 1, 2 and 3 contained colourless solutions, while bottle 4 contained a blue solution. The labels from the bottles were lying scattered on the floor of the cupboard. They were:

Coper (II) sulphate Hydrochloric acid

Lead nitrate Sodium carbonate

By mixing samples of the contents of the bottles, in pairs, the chemist made the following observation:

Bottle 1 + Bottle 2	White pecipitate
Bottle 1 + Bottle 3	White pecipitate
Bottle 1 + Bottle 4	White pecipitate
Bottle 2 + Bottle 3	Colourless gas evolved
Bottle 2 + Bottle 4	No visible reaction
Bottle 3 + Bottle 4	Blue precipitate

31. Bottle 3 contains

(a) copper (II) sulphate (b) hydrochloric acid

(c) lead nitrate (d) sodium carbonate

32. When bottle 1 is mixed with bottle 4, white precipitate is observed, which is

(a) $PbSO_4$ (b) $PbCO_3$ (c) $PbCl_2$ (d) $Pb(NO_3)_2$

Paragraph for Question 33 to 34

$_1H^3$ is used to determine the age of wine. A certain wine that has been aged in bottle has $_1H^3$ only 75% of that in a similar wine, having same mass that was just been bottled. Water content in the bottle is 20g and one $_1H^3$ is present for every 10^{18} atoms of proton. ($t_{1/2}$ of $_1H^3$ = 12.2 years)

33. How long has the aged wine in the bottle?

(a) 12.2 years (b) 12.41 years (c) 5.06 years (d) 11.12 years

34. What was the initial activity of $_1H^3$ in the wine?

(a) 2.4×10^{-3} dps (b) 5.5×10^{10} dps (c) 18 dps (d) 7.6×10^4 dps

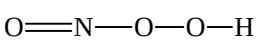
Paragraph for Question 35 to 36

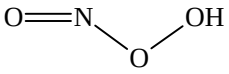
Action of nitric oxide upon human body is dual. Nitric oxide generated in nerve cells will damage the cells, while nitric oxide generated in endothelial cells of blood vessels can relax the vessels and control blood pressure.

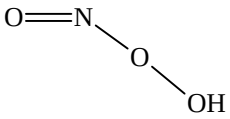
35. The relaxation of blood vessels is caused by a series of changes which are mediated by co-ordination of NO molecule to iron ion. It was known that coordinated NO behaves as CO molecule, which of the following species really exists in the iron complex?

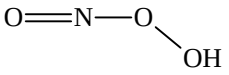
(a) NO (b) NO^+ (c) NO^- (d) none of these

36. The cell damage is caused by free radical OH, which is one of the product of reaction between O_2 and NO. $O_2 + NO + H^+ \rightarrow HNO_3 \rightarrow NO_2 + OH$. In which an intermediate with composition of HNO_3 is evolved. HNO_3 is a weak acid. Choose the structural formula with correct bond angles for the intermediate.

(a) 

(b) 

(c) 

(d) 

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. **Column-I (Reactions)** **Column-II (Involved phenomenon)**

A. $2CH_3CH=O \xrightarrow{OH^-} CH_3-CH=CH-CH=O$ (p) Oxidation

B. $2HCHO \xrightarrow{OH^-} CH_3OH + HCOO^-$ (q) Condensation

C. $phCH=O \xrightarrow{HCN} pH-\overset{OH}{\overset{|}{C}}H-C\equiv N$ (r) Nucleophilic addition

D. $CH_3-\overset{O}{\overset{\|}{C}}-CH_3 \xrightarrow{I_2,OH^-} CH_3-\overset{O}{\overset{\|}{C}}-O^- + CHI_3$ (s) Electrophilic substitution

(t) Nucleophilic substitution

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

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

38. **Column-I (Electrolytes which are electrolysed)** **Column-II (Characteristics)**

A. NaCl (aq) (p) H_2 liberates

B. $AgNO_3$(aq) (q) O_2 liberates

C. $CuSO_4$(Pt-electrode) (r) pH increases

D. H_2SO_4 (aq) (s) pH decreases

(t) Electrolysis of H_2O

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

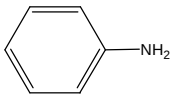
(c) A-(p),(r);B-(q),(s);C-(q),(s);D-(p),(q),(s),(t) (d) None of these

39. **Column-I (Amines)** **Column-II (Characersics)**

A. $CH_3CH_2CH_2NH_2$ (p) Treatment of $NaNO_2$, HCl gives nitroso compound

B. $CH_3CH_2NHCH_3$ (q) Treatment of $NaNO_2$, HCl gives diazonium chloride

C. $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{N}} - CH_3$ (r) Treatment of CH_3I (excess) followed by AgOH, heat gives out alkene

D.  (s) Treatment with HCl and on heating gives dealkylation.

(t) Treatment of p-toluene sulphonyl chloride produces the compound soluble in alkali

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

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

40. A. $PCl_5 \xrightarrow{\text{moist air}}$ (p) One of the product has sp3 hybridization

B. $P_4 + NaOH\,(Conc) + H_2O \xrightarrow[CO_2]{\Delta}$ (q) Disproportionation

C. $H_3PO_3 \xrightarrow{\Delta}$ (r) Hydrolysis

D. $P_4O_6 + H_2O \xrightarrow{\Delta}$

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

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

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41. If $a_1, a_2, a_3 \ldots a_n$ is sequence of +Ve numbers which are in AP with common difference 'd' & $a_1 + a_4 + a_7 + \ldots + a_{16} = 147$, then

(a) $a_1 + a_6 + a_{11} + a_{16} = 98$ (b) $a_1 + a_{16} = 49$

(c) $a_1 + a_4 + a_7 + \ldots + a_{16} = 6a_1 + 45d$ (d) Maximum value of $a_1a_2 \ldots a_{16}$ is $\left(\frac{49}{2}\right)^{16}$

42. $\lim_{x\to\infty} \frac{x^p + x^{p-1} + 1}{x^q + x^{q-2} + 2} = (p > 0, q > 0)$

(a) 0 if $p < q$ (b) 1 if $p = q$ (c) infinite if $p > q$ (d) 1 if $p > q$

43. Tangents are drawn to the circle $x^2 + y^2 = 50$ from a point 'P' lying on the x-axis. These tangents meet the y-axis at points 'P_1' and 'P_2'. Possible coordinates of 'P' so that area of triangle PP_1P_2 is minimum, is/are

(a) (10, 0) (b) $(10\sqrt{2}, 0)$ (c) (–10, 0) (d) $(-10\sqrt{2}, 0)$

44. The equation $(x - \alpha)^2 + (y - \beta)^2 = k(lx + my + n)^2$ represents

(a) a parabola for $k < (l^2 + m^2)^{-1}$ (b) an ellipse for $0 < k < (l^2 + m^2)^{-1}$

(c) a hyperbola for $k > (l^2 + m^2)^{-1}$ (d) a point circle for $k = 0$.

45. If $I = \int_0^1 \frac{dx}{1 + x^{\pi/2}}$, then

(a) $I > \ln 2$ (b) $I < \ln 2$ (c) $I < \pi/4$ (d) $I > \pi/4$

46. Let $h(x) = f(x) - (f(x)^2 + (f(x))^3$ for every real number x. Then

(a) h is increasing whenever f is increasing (b) h is increasing whenever f is decreasing

(c) h is decreasing whenever f is decreasing (d) nothing can be said

47. If $f_r(x)$, $g_r(x)$, $h_r(x)$, $r = 1,2,3$, are polynomials in x such that $f_r(A) = g_r(A) = h_r(A)$, $r = 1,2,3$ and

$$F(x) = \begin{vmatrix} f_1(x) & f_2(x) & f_3(x) \\ g_1(x) & g_2(x) & g_3(x) \\ h_1(x) & h_2(x) & h_3(x) \end{vmatrix}$$, then $F'(x)$ at $x = a$ is

(a) finite (b) 0 (c) 2 (d) –1

48. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, (where $b \neq c$) satisfies the equation $x^2 + k = 0$, then

(a) $a + d = 0$ (b) $k = -|A|$ (c) $k = |A|$ (d) none of these

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** amount the four choice (A), (B), (C) and (D).

Paragraph for Question 49 to 50

If n distinct objects are distributed randomly into n distinct boxes, what is the probability that

49. No box is empty

(a) $\frac{\lfloor n-1}{n^n}$ (b) $\frac{\lfloor n-1}{\lfloor 2n^n}$ (c) $\frac{\lfloor n}{n^n}$ (d) $\frac{\lfloor 2\lfloor n-1}{n^n}$

50. Exactly one box empty

(a) $\frac{\lfloor n\ {}^nC_2}{n^{n-1}}$ (b) $\frac{\lfloor n\ {}^nC_2}{n^n}$ (c) $\frac{n\lfloor n}{n^n}$ (d) $\frac{\lfloor n}{n^n}$

Paragraph for Question 51 to 52

Let Z_1 and Z_2 be complex numbers such that $Z_1^2 - 4Z_2 = 16 + 20i$. Also suppose that roots α and β of $t^2 + Z_1 t + Z_2 + m = 0$ for some complex number m satisfying $|\alpha - \beta| = 2\sqrt{7}$

51. The complex number m lies on

(a) a square with side 7 and centre (4,5) (b) a circle with radius 7 and centre (4,5)

(c) a circle with radius 7 and centre (-4,5) (d) a square with side 7 and centre (-4,5)

52. The greatest value of $|m|$ if m lies on above circle, is

(a) $5 + \sqrt{21}$ (b) $5 + \sqrt{23}$ (c) $7 + \sqrt{43}$ (d) $7 + \sqrt{41}$

Paragraph for Question 53 to 54

Consider the hyperbola $xy + x - y - 9 = 0$ and a line $x = 4$, which intersect the transverse axis at P. A parabola with vertex at P and axis parallel to y-axis passes through (1, 3), then

53. Equation of parabola is

(a) $y = x^2 - 2x + 4$ (b) $9y = x^2 - 8x + 20$

(c) $9y = x^2 - 8x + 34$ (d) $18y = x^2 - 8x + 20$

54. If tangent at P of parabola intersect hyperbola at P′, then area of triangle PCP′ (C is centre of hyperbola) is

(a) 1/2 (b) 1 (c) 1/4 (d) 2

Paragraph for Question 55 to 56

If lines through P(a, 2) meet the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ at A and D and meet the axes at B and C, so that PA, PB, PC, PD are in G.P.

55. The interval for 'a' is

(a) $-6 \le a \le 6$ (b) $-6 < a < 6$ (c) $a > 6$ (d) $a \le 6$

56. The equation of all possible lines if $a = 10$ is

(a) $y - 2 = 2(x - 10)$ (b) $y - 10 = -2(x - 2)$

(c) $y + 2 = -2(x - 10)$ (d) $y + 10 = 2(x - 2)$

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.

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57. A. If, $x, y, z \in N$, then the number of ordered triplets (x, y, z) satisfying $xyz = 243$ is (p) 19

B. The number of terms in the expansion of $(x + y + z)^6$ is (q) 20

C. If $x \in N$ then the no of solutions of $x^2 + x - 400 \le 0$ is (r) 28

D. If $x, y, z \in N$, then the no. of solutions of $x + y + z = 10$ (s) 21

(t) 36

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

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

58. A. The number of solutions of the equation $x^3 + x^2 + 4x + \sin x = 0$ $0 \le x \le 2\pi$ is (p) 4

B. The number of solutions of the equation $2^{\cos x} = |\sin x|$ in $[-2\pi, 2\pi]$ (q) 2

C. The number of solutions of the equation $|\cot x| = \cot x + \frac{1}{\sin x} (0 < x < \pi)$ (r) 1

D. The number of solutions of the equation $x \sin x = 1$ in $[0, 3\pi]$ (s) 8

(t) 0

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

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

59. A. If the vectors $\bar{a}, \bar{b}, \bar{c}$ form sides $\overrightarrow{BC}, \overrightarrow{CA}, \overrightarrow{AB}$ of ΔABC, then (p) $\bar{a}.\bar{b} = \bar{b}.\bar{c} = \bar{c}.\bar{a}$

B. If $\bar{a}, \bar{b}, \bar{c}$ form three adjacent sides of regular tetrahedron, then (q) $\bar{a}.\bar{b} = \bar{b}.\bar{c} = \bar{c}.\bar{a} = \bar{0}$

C. If $\bar{a} \times \bar{b} = \bar{c} : \bar{b} \times \bar{c} = \bar{a}$ then (r) $\bar{a}.\bar{b} + \bar{b}.\bar{c} + \bar{c}.\bar{a} = -\frac{3}{2}$

D. If $\bar{a}, \bar{b}, \bar{c}$ are unit vectors & $\bar{a} + \bar{b} + \bar{c} = \bar{0}$, then (s) $\bar{a}.\bar{b} + \bar{b}.\bar{c} + \bar{c}.\bar{a} = -\frac{5}{2}$

(t) $\bar{a} \times \bar{b} = \bar{b} \times \bar{c} = \bar{c} \times \bar{a}$

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

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

60. A. The equation of the axis of the parabola $9y^2 - 16x - 12y - 57 = 0$ is (p) 10

B. The parametric equation of a parabola is $x = t^2 + 1; y = 2t + 1$. (q) 7

Then the equation of Directrix is

C. A point P on the ellipse $\frac{x^2}{25}+\frac{y^2}{9}=1$ has the eccentric angle $\frac{\pi}{8}$. (r) $3y + 2 = 0$

The sum of the distances of P from the two foci is

D. The foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1$ and the hyperbola $\frac{x^2}{144}-\frac{y^2}{81}=\frac{1}{25}$ (s) $3y - 2 = 0$

coincide then the value of b^2 = (t) $x = 0$

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

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

JEE-ADVANCE: TEST-3

PAPER-II

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

TEST CODE - A

ANSWERS

Physics

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

Chemistry

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

Mathematics

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