Vidyamandir Classes
Gurukul for IITJEE Preparation

Mock Advanced Test-2 Paper-2

TIME : 3 hrs	M.M. : 180

Read the following Instructions very carefully before you proceed.

A. General

1. This booklet is your Question Paper. Do not break the seals of this booklet before being instructed to do so by the invigilators.

2. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers, and electronic gadgets are NOT allowed inside the examination hall.

3. **Using a black ball point pen, darken the bubbles on the upper original sheet.** Apply sufficient pressure so that the impression is created on the bottom sheet.

4. DO NOT TAMPER WITH/MUTILATE THE OMR OR THE BOOKLET.

5. Read carefully the Instructions printed at the beginning of each section.

B. Filling the Right Part of the OMR

6. For answering a question, an ANSWER SHEET (OMR SHEET) is provided separately. Please fill your **Test Code, Roll No.** and **Group** properly in the space given in the ANSWER SHEET.

C. Question Paper Format

The question paper consists of **3 SUBJECTS** (Physics, Chemistry and Mathematics). Each SUBJECT consists of one section only. Each section contains three types (1, 2 & 3).

12. **TYPE-1** contains 8 Multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE CHOICES** may be correct.

13. **TYPE-2** contains 4 Paragraphs each describing theory, experiment, data etc. There are 8 multiple choice questions relating to three paragraphs with 2 questions on each paragraph. Each question of a particular paragraph has four choices (A), (B), (C) and (D) out of which **ONLY ONE CHOICE is correct**.

14. **TYPE-3** contains **4 Match the following Objective type Questions**. Each question contains statements given in 2 columns. Statements in the column I have to be matched with statements in column II and then option with the appropriate code is to be marked in the answer sheet. **The options for the correct match are provided as** (A), (B), (C) and (D) out of which **ONLY ONE CHOICE is Correct**.

D. Marking Scheme

15. For each question of TYPE-1 and TYPE-2, you will be awarded **3 marks** if you darken the bubble corresponding to the correct answer ONLY and zero (0) marks if no bubbles are darkened**. In all other cases, minus one (–1) mark will be awarded in these sections.**

16. For each question of TYPE-3, you will be awarded **3 Marks** if you have darkened only the bubble corresponding to all correct answers and zero mark if no bubble is darkened. In all other cases, **minus ONE (–1) mark (NEGATIVE MARKING)** will be given.

PART - I (PHYSICS)	60 MARKS

TYPE-1

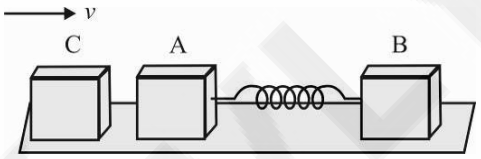
MULTIPLE CORRECT ANSWERS

This section contains 8 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct:

1. A point $P\left(R\sqrt{3},0,0\right)$ lies on the axis of a ring of mass M and radius R. The ring is located in *y-z* plane with its centre at origin O. A small particle of mass m starts from P and reaches O under gravitational attraction only. Its speed at O will be :

(A) $\sqrt{\frac{GM}{R}}$ **(B)** $\sqrt{\frac{Gm}{R}}$ **(C)** $\sqrt{\frac{GM}{\sqrt{2}R}}$ **(D)** $\sqrt{\frac{Gm}{\sqrt{2}R}}$

2. Two blocks A and B each of mass m are connected by a light spring of natural length L and spring constant k. The blocks are initially resting on a smooth horizontal floor with the spring at its natural length, as shown. A third identical block C, also of mass *m*, moves on the floor with a speed *v* along the line joining A to B and collides elastically with A. Then :



(A) the kinetic energy of the A-B system at maximum compression of the spring is zero

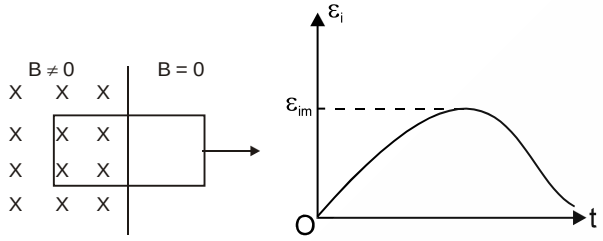
(B) the kinetic energy of the A-B system at maximum compression of the spring is $\left(\frac{mv^2}{4}\right)$

(C) the maximum compression of the spring is $\left(v\sqrt{\frac{m}{k}}\right)$

(D) the maximum compression of the spring is $\left(v\sqrt{\frac{m}{2k}}\right)$

SPACE FOR ROUGH WORK

3. A plane rectangular loop is placed in a magnetic field. The loop was pulled out of the magnetic field at a variable velocity. The *EMF* induced in the loop due to this field is denoted by ε_i whose maximum value is ε_{im}. Assume that $\vec{B}$ is uniform and constant. ε_i is plotted against time *t* as shown in the graph. Which of the following are/is correct statement(s):



(A) ε_{im} is independent of rate of removal of coil from the field

(B) The total charge that passes through any point of the loop in the process of complete removal of the loop does not depend on velocity of removal

(C) The total area under the curve (ε_i vs *t*) is independent of rate of removal of coil from the field

(D) The area under the curve is dependent on the rate of removal of the coil

4. A driver in a stationary car blows a horn which produces monochromatic sound waves of frequency 1000 Hz normally towards a reflecting wall. The wall approaches the car with a speed of 3.3 ms^{-1}. The speed of sound in air is 330 *m*/sec :

(A) The frequency of sound reflected from wall as heard by the driver is 1020 Hz

(B) The frequency of sound reflected from wall as heard by the driver is 980 Hz

(C) The percentage increase in frequency of sound as heard by the driver after reflection from wall is 2%

(D) The percentage decrease in frequency of sound as heard by the driver after reflection from wall is 2%

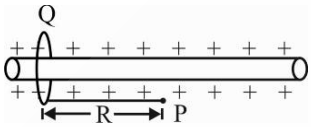
SPACE FOR ROUGH WORK

5. In YDSE, two identical sources each of intensity I_0 have a separation $d = \frac{\lambda}{8}$, where λ is the wavelength of the waves emitted by either source. The phase difference of the sources is $\frac{\pi}{4}$. The intensity distribution I (θ) on the screen as a function of θ, which specifies the direction from the sources to the distant observation point P is given by :

(A) $I(\theta) = 4I_0 \cos^2 \theta$ **(B)** $I(\theta) = 4I_0 \cos^2\left(\frac{\pi \sin\theta}{8}\right)$

(C) $I(\theta) = 4I_0 \cos^2\left[\frac{\pi}{8}(\sin\theta + 1)\right]$ **(D)** $I(\theta) = I_0 \sin^2(\theta/2)$

6. Figure shows a smooth long non-conducting rod of radius r charged with uniform linear charge density λ, fixed horizontally. A neutral and smooth ring Q of mass M can slide freely on the rod which happens to just fit in it, and P is non-conducting particle having a mass *m* and charge q, attached to the ring Q by means of a non-conducting and inextensible string of length R. Choose the correct options when string becomes vertical, if P is released from the position shown in figure.



(A) The speed of particle P is $\left[\left(1+\frac{m}{M}\right)^{-1}\left(2gR + \frac{q\lambda}{\pi\varepsilon_0 m}\ln\left(1+\frac{R}{r}\right)\right)\right]^{1/2}$

(B) The tension in the string is $mg + \frac{mv^2}{R+r} + \frac{q\lambda}{2\pi \in_0 (r+R)}$ where *v* is the speed of particle at the bottom

(C) The speed of particle P is $\left[\left(1-\frac{m}{M}\right)^{-1}\left(2gR + \frac{q\lambda}{\pi\varepsilon_0 m}\ln\left(1-\frac{R}{r}\right)\right)\right]^{1/2}$

(D) The tension in the string is $mg - \frac{mv^2}{R+r} + \frac{q\lambda}{2\pi \in_0 (r+R)}$ where *v* is the speed of particle at the bottom

SPACE FOR ROUGH WORK

7. A bimetallic strip is formed out of two identical strips one of copper and the other of brass. The coefficients of linear expansion of the two metals are α_C and α_B. On heating, the temperature of the strip goes up by ΔT and the strip bends to form an arc of radius of curvature R. Then R is :

(A) proportional to ΔT **(B)** inversely proportional to ΔT

(C) proportional to $|\alpha_B - \alpha_C|$ **(D)** inversely proportional to $|\alpha_B - \alpha_C|$

8. The radius of the orbit of an electron in a Hydrogen-like atom is 4.5 a_0 where a_0 is the Bohr radius. Its orbital angular momentum is $\frac{3h}{2\pi}$. It is given that h is Planck's constant and R is Rydberg constant. The possible wavelength(s), when the atom de-excites, is(are) :

(A) $\frac{9}{32R}$ **(B)** $\frac{9}{16R}$ **(C)** $\frac{9}{5R}$ **(D)** $\frac{4}{3R}$

SPACE FOR ROUGH WORK

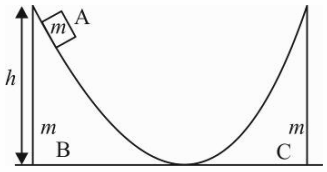
TYPE-2

LINK COMPREHENSION TYPE

This section contains 8 multiple choice questions relating to four paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONLY ONE is correct.

Paragraph for Questions 9 - 10

Block *A* is placed on wedge *B* at a height *h* above ground. Block and the two wedges *B* and *C* are all of same mass *m*. Neglect friction every where. The two wedges are placed as shown in the figure.



9. The velocity of B when A has slide down from it is :

(A) $\sqrt{gh}$ **(B)** $\sqrt{\frac{gh}{2}}$ **(C)** $\frac{\sqrt{gh}}{2}$ **(D)** None of these

10. The maximum height upto which block A rises on wedge C is :

(A) h **(B)** $h/2$ **(C)** $h/4$ **(D)** None of these

Paragraph for Questions 11 - 12

A thermal power plant produces electric power of 600 kW at 4000 V, which is to be transported to a place 20 *km* away from the power plant for consumers' usage. It can be transported either directly with a cable of large current carrying capacity or by using a combination of step-up and step-down transformers at the two ends. The drawback of the direct transmission is the large energy dissipation. In the method using transformers, the dissipation is much smaller. In this method, a step-up transformer is used at the plant side so that the current is reduced to a smaller value. At the consumers' end, a step-down transformer is used to supply power to the consumers at the specified lower voltage. It is reasonable to assume that the power cable is purely resistive and the transformers are ideal with the power factor unity. All the currents and voltage mentioned are rms values.

11. If the direct transmission method with a cable of resistance 0.4 Ω km^{-1} is used, the power dissipation (in %) during transmission is :

(A) 20 **(B)** 30 **(C)** 40 **(D)** 50

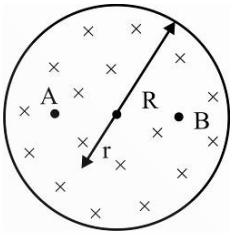
12. In the method using the transformers, assume that the ratio of the number of turns in the primary to that in the secondary in the step-up transformer is 1 : 10. If the power to the consumers has to be supplied at 200 V, the ratio of the number of turns in the primary to that in the secondary in the step-down transformer is :

(A) 200 : 1 **(B)** 150 : 1 **(C)** 100 : 1 **(D)** 50 : 1

SPACE FOR ROUGH WORK

Paragraph for Questions 13 - 14

Magnetic field in a cylindrical region is increasing at a rate of $\frac{dB}{dt} = 0.05\,\text{T/s}$ as shown in the figure. The radius of the cylindrical region is R = 3 *cm*. A concentric non-conducting ring of radius $r(r = \frac{R}{2})$ is placed in this region as shown in figure. A and B are diametrically opposite points.



13. The direction of induced electric field at the location of ring is :

(A) tangential to ring in clockwise direction **(B)** tangential to ring in anti-clockwise direction

(C) radially inwards **(D)** radially outwards

14. The emf induced between the points A and B, while moving diametrically along AB is :

(A) Zero **(B)** 7.08×10^{-5} V **(C)** 3.54×10^{-5} V **(D)** 1.76×10^{-5} V

Paragraph for Questions 15 - 16

A small particle of mass *m* moves in such a way that the potential energy of particle is given as $U = -\frac{1}{2}m\alpha^2 r^2$ where α is constant and *r* is the distance of particle from centre. If Bohr's model of quantization of angular momentum and circular orbit is valid for the particle, answer the following question (*h* = Planck's constant)

15. The radius of n^{th} orbit of the particle is :

(A) $\left(\frac{nh}{4\pi m\alpha}\right)^{\frac{1}{2}}$ **(B)** $\left(\frac{nh}{2\pi m\alpha}\right)^{\frac{1}{2}}$ **(C)** $\left(\frac{n^2 h}{4\pi m\alpha}\right)^{\frac{1}{2}}$ **(D)** $\left(\frac{nh}{4\pi m\alpha}\right)^{\frac{1}{2}}$

16. Total energy of particle in its orbits is :

(A) $-\frac{nh\alpha}{4\pi}$ **(B)** $\frac{nh\alpha}{2\pi}$ **(C)** Zero **(D)** $-\frac{nh\alpha}{2\pi}$

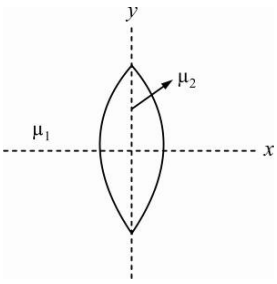
SPACE FOR ROUGH WORK

TYPE-3

MATCH MATRIX TYPE

This section contains 4 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

17. A convex lens of refractive index μ_2 is kept in a medium of refractive index μ_1 as shown.



Column I		Column II	
(P)	On increasing value of μ_1 if initially $\mu_1 < \mu_2$	**(1)**	$\|f\|$ increases and converging
(Q)	On increasing the value of μ_1 if $\mu_1 > \mu_2$	**(2)**	$\|f\|$ may decrease or increase and lens will be diverging
(R)	When lens is cut into two parts along yy´, then for any one part	**(3)**	$\|f\|$ increases and nature of lens remains unchanged
(S)	μ_1 is increased but $\mu_1 < \mu_2$	**(4)**	$\|f\|$ increases then decreases

Codes:

	P	Q	R	S		P	Q	R	S
(A)	4	2	1, 3	1, 3	**(B)**	2	2	1, 3	1, 3
(C)	4	2	1, 3	4	**(D)**	3	1	2	4

SPACE FOR ROUGH WORK

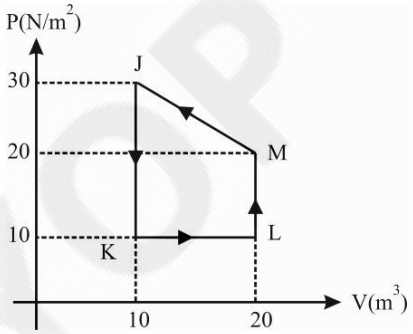
18. For the question given below : M = Mass; L = Length; T = Time; A = Ampere

Column I		Column II	
(P)	Torque	**(1)**	$ML^{-1}T^{-2}$
(Q)	Pressure	**(2)**	$ML^{2}T^{-2}$
(R)	Electric field intensity	**(3)**	$MLA^{-1}T^{-3}$
(S)	Intensity of a wave	**(4)**	MT^{-3}

Codes:

	P	Q	R	S		P	Q	R	S
(A)	1	2	3	4	**(B)**	2	1	3	4
(C)	1	2	4	3	**(D)**	2	1	4	3

19. An ideal gas undergoes a cyclic process as shown in P-V graph. Match each process given in column-I with the corresponding results given in column II.



Column I		Column II	
(P)	Process J-K	**(1)**	$\Delta W > 0$
(Q)	Process K-L	**(2)**	$\Delta W < 0$
(R)	Process L-M	**(3)**	$\Delta Q > 0$
(S)	Process M-J	**(4)**	$\Delta Q < 0$

Codes:

	P	Q	R	S		P	Q	R	S
(A)	3	1, 4	4	2, 4	**(B)**	3	1, 3	3	2, 3
(C)	4	1, 4	4	2, 4	**(D)**	4	1, 3	3	2, 4

SPACE FOR ROUGH WORK

20. MATCH THE FOLLOWING LISTS :

Column I		Column II	
(P)	Velocity of its centre of mass changes	**(1)**	A stone is tied to one end of a string and is doing uniform circular motion in a horizontal circle having centre *O*.
(Q)	Its angular momentum about point *O* is constant	**(2)**	A ball is dropped from a plane flying horizontally with constant velocity. Neglect air resistance. Point *O* is point of projection on plane from which the ball is dropped.
(R)	Its kinetic energy is constant	**(3)**	A uniform sphere is in pure rolling, rolling down an inclined plane where *O* is the centre of the sphere.
(S)	Its angular velocity changes about point O.	**(4)**	A satellite is moving in elliptical orbit around sun. Point *O* is centre of the sun.

Codes:

	P	Q	R	S		P	Q	R	S
(A)	2,3,4	1,4	1	3,4	**(B)**	1,2,3,4	1,2,4	1	3,4
(C)	1,2,3	1,2,4	1	2,3,4	**(D)**	1,2,3,4	1,4	1	2,3,4

SPACE FOR ROUGH WORK

PART - II (CHEMISTRY)	60 MARKS

TYPE-1

MULTIPLE CORRECT ANSWERS

This section contains 8 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct:

1. Alumino thermite process is NOT used for the extraction of :

(A) Sn from SnO_2 **(B)** Cr from Cr_2O_3

(C) Mn from MnO_2 **(D)** Fe from Fe_2O_3

2. Which of the following is(are) correct for following equilibrium ?

$$CuSO_4.5H_2O(s) \rightleftharpoons CuSO_4.3H_2O(s) + 2H_2O(g) \qquad K_p = 1.44 atm^2 \text{ at } 27°C$$

(A) $CuSO_4.5H_2O$ is efflorescent if P_{H_2O} in atmosphere is less than 1.2 atm

(B) $CuSO_4.5H_2O$ is deliquescent if P_{H_2O} in atmosphere is greater than 1.2 atm

(C) Value of K_p is dependent on vapour pressure of water at a given T

(D) Enthalpy of reaction depends on temperature

3. The correct statement about NO_2 is(are) :

(A) All $N-O$ bond length are equal

(B) On cooling NO_2 becomes diamagnetic

(C) Yellow colour of HNO_3 is due to presence of NO_2

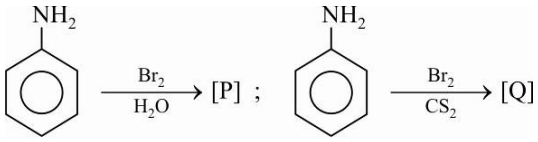
(D) NO_2 has bent structure

4. $^{9}_{4}Be + (X) \longrightarrow {}^{12}_{6}C + (Y)$

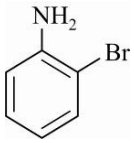
The species X and Y involved in above reaction is/are :

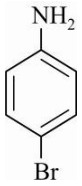
(A) (α, n) **(B)** (β, n) **(C)** $(n, {}^{2}_{1}H)$ **(D)** $(\gamma, {}^{1}_{1}H)$

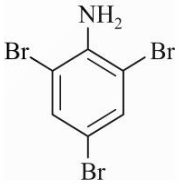
SPACE FOR ROUGH WORK

5. 

Identify product (P) and (Q) formed in above reactions from following options :

I. 

II. 

III. 

	[P]	[Q]		[P]	[Q]
(A)	I	II	**(B)**	III	II
(C)	III	III	**(D)**	II	II

6. **Reaction I :** $R-\overset{\overset{O}{\|}}{C}-NH_2 \xrightarrow[KOD,\ D_2O]{Br_2}$

Reaction II : $R-\overset{\overset{O}{\|}}{C}-ND_2 \xrightarrow[KOH,\ H_2O]{Br_2}$

Product(s) of reaction I and II is(are) :

(A) $R-NH_2$ in both reactions

(B) $R-ND_2$ in both reactions

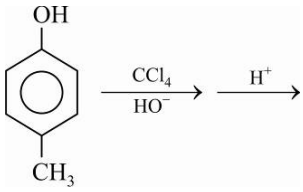
(C) $R-ND_2$ in reaction I while $R-NH_2$ in reaction II

(D) $R-NH_2$ in reaction I while $R-ND_2$ in reaction II

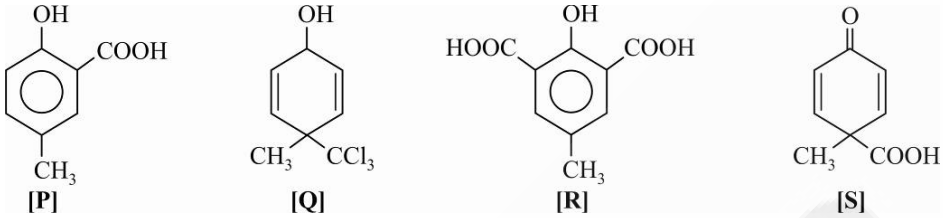
7. K_{sp} of Hg_2Cl_2 is 4×10^{-24} at 300 K. The solubility (in mol/L) of Hg_2Cl_2 in a 0.1 M NaCl solution is :

(A) 4×10^{-22} **(B)** 2×10^{-11} **(C)** 4×10^{-6} **(D)** 4×10^{-10}

SPACE FOR ROUGH WORK

8. 

In the above reaction, the product(s) formed is(are) :



[P] **[Q]** **[R]** **[S]**

(A) P(Major) **(B)** S(Minor) **(C)** R(Minor) **(D)** Q(Minor)

SPACE FOR ROUGH WORK

TYPE-2

LINK COMPREHENSION TYPE

This section contains 8 multiple choice questions relating to four paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONLY ONE is correct.

Paragraph for Questions 9 - 10

An aqueous solution of a mixture of two inorganic salts, when treated with dilute HCl, gave a precipitate (P) and a filtrate (Q). The precipitate (P) was found to be insoluble in hot water. The filtrate (Q) remain unchanged, when treated with H_2S in an alkaline medium. However it gave a precipitate (R) with H_2S in dilute acidic medium. The precipitate (R) is dissolved in conc. HNO_3 followed by excess of NH_4OH gave a blue coloured solution (S).

9. The precipitate (P) might contain :

(A) Only Hg_2Cl_2 **(B)** Only AgCl **(C)** Both Hg_2Cl_2, AgCl **(D)** Only $PbCl_2$

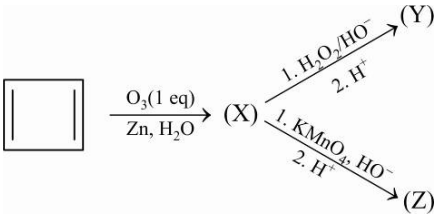
10. Central metal in compound (S) is :

(A) sp^3 hybridized, paramagnetic **(B)** sp^3 hybridized, diamagnetic

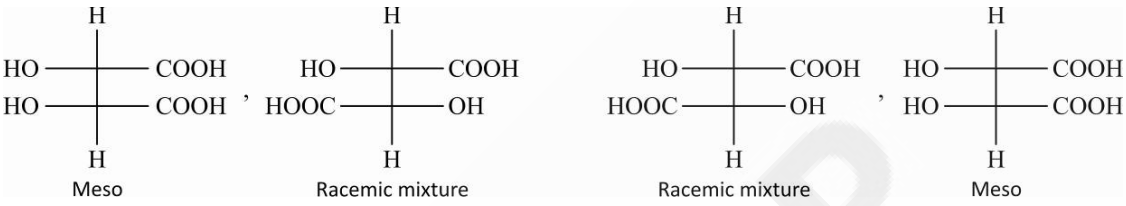
(C) dsp^2 hybridized, paramagnetic **(D)** dsp^2 hybridized, diamagnetic

SPACE FOR ROUGH WORK

Paragraph for Questions 11 - 12



11. The compound (Y) and (Z) respectively are :



(A) **(B)**

(C) **(D)**

12. Which of the following is false ?

(A) Maleic acid on reaction with alk. $KMnO_4$, followed by acidification gives (Z)

(B) Fumaric acid with H_2O_2, HO^-, followed by acidification gives (Z)

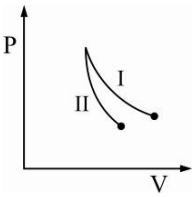
(C) (Y) and (Z) are enantiomers

(D) (Y) and (Z) can be separated by fractional distillation

SPACE FOR ROUGH WORK

Paragraph for Questions 13 - 14

A fixed mass of a gas undergoes expansion through path I and II as shown in figure.



13. The two path I and II represented in above graph respectively are :

(A) reversible isothermal expansion and reversible adiabatic expansion

(B) reversible adiabatic expansion and reversible isothermal expansion

(C) Both are reversible isothermal expansion

(D) Both are reversible adiabatic expansion

14. Which of the following is true for path I and II ?

(A) More loss of heat is observed when gas undergoes expansion through path I

(B) More loss of heat is observed when gas undergoes expansion through path II

(C) Equal loss of heat is observed when gas undergoes expansion through path I and II

(D) None of these

Paragraph for Questions 15 - 16

White phosphorus is heated with alkali potash to give a mixture of **M** and **N**. **M** on acidification gives **R** which on heating gives **S** and **N**. **R** when reacted with $AgNO_3$ forms metallic precipitate of **T**.

15. **M** and **N** are respectively :

(A) Sodium hypophosphite and phosphine

(B) Sodium hydrogen phosphate and sodium hypophosphite

(C) Phosphine and sodium hypophosphite

(D) Phosphine and sodium hydrogenphosphate

16. **R**, **S** and **T** are :

(A) H_3PO_2, H_3PO_4, Ag **(B)** H_3PO_2, H_3PO_3, Ag

(C) H_3PO_3, H_3PO_2, Ag_3P **(D)** H_3PO_3, H_3PO_4, Ag

SPACE FOR ROUGH WORK

TYPE-3

MATCH MATRIX TYPE

This section contains 4 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

17. The standard reduction potential data at $25^{\circ}C$ is given below:

$$E^{\circ}\left(Fe^{3\oplus}, Fe\right) = -0.04V$$

$$E^{\circ}\left(Fe^{3\oplus}, Fe^{2\oplus}\right) = +0.77V$$

$$E^{\circ}\left(Cu^{2\oplus}, Cu\right) = +0.34V$$

$$E^{\circ}\left(Cu^{\oplus}, Cu\right) = +0.52V$$

$$E^{\circ}\left[O_2(g) + 4H^{\oplus} + 4e^{\ominus} \rightarrow 2H_2O\right] = +1.23V$$

$$E^{\circ}\left[O_2(g) + 2H_2O + 4e^{\ominus} \rightarrow 4HO^{\ominus}\right] = +0.40V$$

$$E^{\circ}\left(Cr^{3\oplus}, Cr^{2\oplus}\right) = -0.4V$$

$$E^{\circ}\left(Cr^{2\oplus}, Cr\right) = -0.91V\,.$$

Match E° of the redox pair in Column I with the values given in Column II and select the correct answer using the code given below the columns :

Column I		Column II	
(P)	$E^{\circ}\left(Fe^{2\oplus}, Fe\right)$	**(1)**	–0.36V
(Q)	$E^{\circ}\left(4H_2O \rightleftharpoons 4H^{\oplus} + 4HO^{\ominus}\right)$	**(2)**	–0.74V
(R)	$E^{\circ}\left(Cu^{2\oplus} + Cu \rightarrow 2Cu^{\oplus}\right)$	**(3)**	–0.44V
(S)	$E^{\circ}\left(Cr^{3\oplus}, Cr\right)$	**(4)**	–0.83V

Codes:

	P	Q	R	S		P	Q	R	S
(A)	3	4	1	2	**(B)**	4	1	2	3
(C)	1	2	3	4	**(D)**	1	3	2	4

SPACE FOR ROUGH WORK

18. An aqueous solution of X is added slowly to an aqueous solution of Y as shown in Column I. The variation in conductivity of these reactions is given in Column II. Match Column I with Column II and select the correct answer using the code given below the Columns :

Column I		Column II	
(P)	$\underset{X}{NH_3} + \underset{Y}{CH_3COOH}$	**(1)**	Conductivity decreases and then increases
(Q)	$\underset{X}{KCl} + \underset{Y}{AgNO_3}$	**(2)**	Conductivity decreases and then does not change much
(R)	$\underset{X}{CH_3COOH} + \underset{Y}{KOH}$	**(3)**	Conductivity increases and then does not change much
(S)	$\underset{X}{KOH} + \underset{Y}{HCl}$	**(4)**	Conductivity does not change much and then increases

Codes:

	P	Q	R	S		P	Q	R	S
(A)	3	4	2	1	**(B)**	4	3	2	1
(C)	2	3	4	1	**(D)**	1	4	3	2

19. Match the products for column I reaction with the given in column II.

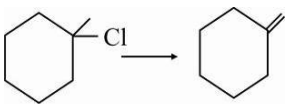
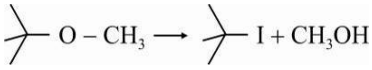
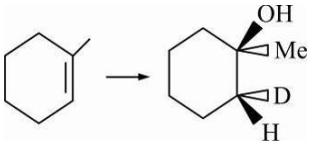
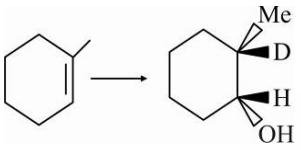
Column I		Column II	
(P)	$XeF_2 + H_2O \longrightarrow$	**(1)**	Xe
(Q)	$XeF_4 + H_2O \longrightarrow$	**(2)**	HF
(R)	$XeF_6 + H_2O \longrightarrow$	**(3)**	XeO_3
(S)	$XeF_2 + NO \longrightarrow$	**(4)**	O_2

Codes:

	P	Q	R	S		P	Q	R	S
(A)	1,2,4	1,2,3,4	2, 3	1	**(B)**	1,3	1,4	3	4
(C)	1,3,4	1,3	4	1,4	**(D)**	1,3,4	1,3,4	3	1,4

SPACE FOR ROUGH WORK

20. Match the chemical conversions in Column I with the appropriate reagents in Column II and select the correct answer using the code given below Columns :

Column I		Column II	
(P)		**(1)**	$Hg(OOCCH_3)_2 / NaBD_4, HO^{\ominus}$
(Q)		**(2)**	B_2D_6, THF / H_2O_2, $HO^{\ominus}$
(R)		**(3)**	conc. HI
(S)		**(4)**	$(CH_3)_3CO^{\ominus}K^{\oplus}$

Codes:

	P	Q	R	S		P	Q	R	S
(A)	4	3	1	2	**(B)**	4	3	2	1
(C)	4	1	2	3	**(D)**	4	1	3	2

SPACE FOR ROUGH WORK

PART - III (MATHEMATICS)	60 MARKS

TYPE-1

MULTIPLE CORRECT ANSWERS

This section contains 8 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct:

1. Let z be a complex number satisfying $|z-3-4i|=1$. If z_1 and z_2 denotes the value of z for which arg(z) is maximum and minimum respectively and complex number w satisfying, $|w|=|z_1-w|=|z_2-w|$, then:

(A) $|w-3-4i|=\frac{5}{2}$ **(B)** $|w|=\frac{5}{2}$ **(C)** $25|z_1-z_2|^2=96$ **(D)** $|z_1|=|z_2|$

2. The equation $(x-log_2 3)(x-log_3 4)+(x-log_3 4)(x-log_4 2)+(x-log_4 2)(x-log_2 3)=0$ has :

(A) one root lie between $log_3 4$ and $log_2 3$ **(B)** one root lie between $log_4 2$ and $log_3 4$

(C) both roots imaginary **(D)** both roots real

3. Let $A=\begin{bmatrix}1 & 2 & 0\\ 0 & 2 & 0\\ 0 & -1 & 2\end{bmatrix}$ be a given matrix. If $P=A^4+8A$ and $Q=-5A^3+8A^2-10A$, then :

(A) $tr.(P+Q)=10$ **(B)** $tr.(P+Q)=0$ **(C)** $det.(P+Q)=8$ **(D)** $det.(P+Q)=32$

[Note : *tr*.(*M*) denotes the trace of matrix *M* and det. (*M*) denotes determinant of matrix *M*]

4. Consider $f(x)=\frac{x\left(e^x-e^{-x}\right)+2}{2x}$, $x\neq 0$. Identify which of the following statement(s) is(are) correct ?

(A) $f(x)$ has no critical points

(B) $f(x)$ has exactly two critical points

(C) $f(x)$ has exactly one point of inflection

(D) $f(x)$ is concave downwards in $(-\infty, 0)$ and concave upwards in $(0, \infty)$

SPACE FOR ROUGH WORK

5. Let $f(x)$ be a non-constant differentiable function satisfying $f(x) = x^3 - \int_0^1 (f(t) + x)\,dt$, then :

(A) $f(x)$ is monotonic

(B) $\lim_{x \to 0} (f'(x) + 2)^{\operatorname{cosec} x}$ equals 1

(C) $f(x)$ decreases for $x \in \left(\frac{-1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$

(D) Differential coefficient of $f(x)$ with respect to ℓnx at $x = 2$ is 21

6. Consider two circles S_1 : $x^2 + y^2 - 6x = 0$ and S_2 : $x^2 + y^2 + 4x = 0$ and ℓ_1, ℓ_2, ℓ_3 are their common tangents. Which of the following statements is(are) CORRECT ?

(A) Area of triangle formed by the lines ℓ_1, ℓ_2 and ℓ_3 is $12\sqrt{6}$

(B) Equation of transverse common tangent is $x = 0$

(C) Equation of direct common tangent having positive y intercept is $x - 2\sqrt{6}y + 12 = 0$

(D) Equation of circle circumscribing the triangle formed by the direct common tangent and chord of contact of point of intersection of direct common tangent with respect to S_2 is $x^2 + y^2 + 14x + 24 = 0$

7. Consider a plane P containing the line of intersection of two planes $x + y + z = 1$ and $2x + y - z - 2 = 0$. If plane P makes an angle θ with the line $\frac{x}{1} = \frac{y}{-1} = \frac{z}{1}$ such that $\cot\theta = \sqrt{38}$, then the equation of plane P can be :

(A) $3x + 2y - 3 = 0$ **(B)** $3x + 2y - 5 = 0$

(C) $7x + 2y - 8z + 7 = 0$ **(D)** $7x + 2y - 8z = 7$

8. In triangle ABC, the altitude from A to the base BC meets it at the point D such that $BD : DC = 1 : 2$. Also $AD = 5$ and $\angle ABD = 30°$, then which of the following statement(s) is(are) correct?

(A) The smallest angle of triangle ABC is C

(B) The area of triangle ABC equals $\frac{75\sqrt{3}}{2}$

(C) The radius of circle circumscribing the triangle ABC is $\sqrt{325}$

(D) If E is the foot of median drawn through A then $DE = \frac{5\sqrt{3}}{2}$

SPACE FOR ROUGH WORK

TYPE-2

LINK COMPREHENSION TYPE

This section contains 8 multiple choice questions relating to four paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONLY ONE is correct.

Paragraph for Questions 9 - 10

If a, b, c are distinct non-zero complex numbers such that $|a| = |b| = |c|$.

9. If z_1 and z_2 are the roots of $az^2 + bz + c = 0$ such that $|z_1| = 2$, then the value of $(16z_2 + z_1)$ is equal to :

(A) $\frac{c}{b}$ **(B)** $\frac{-4c}{b}$ **(C)** $\frac{4c}{b}$ **(D)** $\frac{-c}{b}$

10. If $az^2 + bz + c = 0$ and $bz^2 + cz + a = 0$ have a root of modulus 1, then the equation $az^2 + bz + c = 0$ and $bz^2 + cz + a = 0$

(A) have both roots common **(B)** have exactly one root common

(C) can not have common root **(D)** cannot be determined

Paragraph for Questions 11 - 12

A bag contains 4 white, 3 black and 2 red balls. Balls are drawn from the bag one by one without replacement.

11. The probability that 4^{th} ball is red is equal to :

(A) 1/16 **(B)** 1/9 **(C)** 2/9 **(D)** 3/11

12. The probability that 5^{th} ball is black given that 4^{th} ball is red is equal to

(A) 1/8 **(B)** 3/8 **(C)** 2/11 **(D)** 3/11

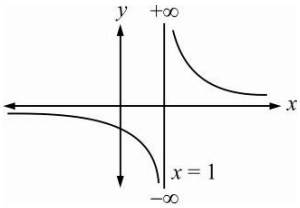
SPACE FOR ROUGH WORK

Paragraph for Questions 13 - 14

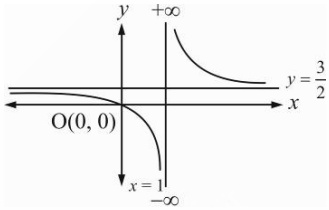
Let $C_1 : y = f(x)$ and $C_2 : y = g(x)$ be two curves passing through $M(2, 1)$ such that the length of intercept made by any tangent on the x-axis is equal to the square of x-coordinate of the point of tangency. Given that $f(-2) = \frac{1}{3}$ and $g(-2) = 3$.

13. Which of the following best represent the graph of $f(x)$?

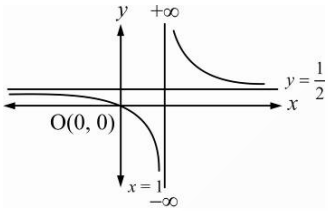
(A)



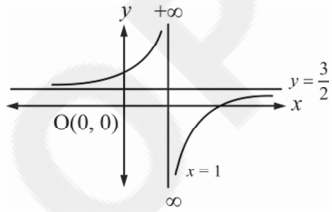
(B)



(C)



(D)



14. The value of definite integral $\int_0^1 g(x)\,dx$ is equal to :

(A) $\frac{3}{2}(1+\ell n2)$ **(B)** $\frac{2}{3}(1-\ell n2)$ **(C)** $\frac{3}{2}(1-\ell n2)$ **(D)** $\frac{2}{3}(1+\ell n2)$

Paragraph for Questions 15 - 16

Tangents are drawn from any point on ellipse $E : \frac{x^2}{9} + \frac{y^2}{4} = 1$ to the circle $S : x^2 + y^2 = 1$ and respective chord of contact always touches the conic 'C'.

15. The eccentricity of the conic 'C' is :

(A) $\frac{1}{2}$ **(B)** $\frac{1}{\sqrt{3}}$ **(C)** $\frac{\sqrt{5}}{3}$ **(D)** $\sqrt{3}$

16. The minimum distance between conic 'C' and ellipse E is :

(A) 1 **(B)** 2 **(C)** $\frac{5}{2}$ **(D)** $\frac{3}{2}$

SPACE FOR ROUGH WORK

TYPE-3

MATCH MATRIX TYPE

This section contains 4 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

17. MATCH THE FOLLOWING:

	Column I		Column II
(P)	Consider a matrix $A=\left[a_{ij}\right]_{3\times3}$, where $a_{ij}=\begin{cases} i+j, & \text{if } ij=\text{even} \\ i-j, & \text{if } ij=\text{odd} \end{cases}$. If b_{ij} is cofactor of a_{ij} in matrix A and $C_{ij}=\sum_{r=1}^{3}a_{ir}b_{jr}$, then value of $\frac{1}{4}\left\lvert\sqrt[3]{det.\left[C_{ij}\right]_{3\times3}}\right\rvert$ is equal to	**1**	1
(Q)	The possible integral value of $f(x)=\frac{(x-2)^8+4(x-2)^7+(x-2)^6+1}{(x-2)^6}\forall\ x>2,$ is	**2**	2
(R)	The curves $(x+2)\left(x-2t^2\right)+\left(\frac{y-4t}{t}\right)\left(ty+2-2t^2\right)=0 \quad \forall\ t\in R-\{0\}$ passes through a fixed point $P(a, b)$, then value of $(a + 4b)$ is equal to	**3**	4
(S)	The lengths of two opposite edges of tetrahedron are 2 and 3 units and shortest distance between them is equal to 4 units and angle between them is $\frac{\pi}{6}$, if volume of tetrahedron is $2V$, then V is equal to	**4**	7

Codes :

	P	Q	R	S		P	Q	R	S
(A)	2	3	1	4	**(B)**	1	3	2	4
(C)	3	4	2	1	**(D)**	4	3	2	1

SPACE FOR ROUGH WORK

18. MATCH THE FOLLOWING:

	Column I		Column II
(P)	If $\int_{-a}^{a}\left(e^x+\cos x\,\ell n\left(x+\sqrt{1+x^2}\right)\right)dx>\frac{3}{2}$, then a can not be	**1**	1
(Q)	In ΔABC, if $2a^2+4b^2-4ab=2ac-c^2$, then $\frac{8\sqrt{5}}{\sqrt{3}}\sin(A+C)$ is equal to	**2**	2
(R)	The solution of $x^2dy-y^2dx=xy^2(y-x)dy$ is $\ell n\left\|\frac{x-y}{xy}\right\|=\frac{y^m}{2}+C$, (where C is arbitrary constant), then the value of m is equal to	**3**	1/2
(S)	The remainder when $\left(\sum_{r=1}^{5}{}^{20}C_{2r-1}\right)^5$ is divided by 11 is less than or equal to	**4**	5

Codes :

	P	**Q**	**R**	**S**		**P**	**Q**	**R**	**S**
(A)	4	3	2	1	**(B)**	3	4	2	1
(C)	3	4	1	2	**(D)**	4	3	1	2

SPACE FOR ROUGH WORK

19. MATCH THE FOLLOWING:

	Column I		Column II
(P)	If the distance between two parallel tangents having slope m drawn to the hyperbola $\frac{x^2}{9}-\frac{y^2}{49}=1$ is 2, then $\frac{2}{5}\lvert m\rvert$ is equal to	**1**	5
(Q)	If a variable line has its intercepts on the coordinate axes e and e', where $\frac{e}{2}$ and $\frac{e'}{2}$ are the eccentricities of a hyperbola and its conjugate hyperbola, then the line always touches the circle $x^2+y^2=r^2$, where r is equal to	**2**	4
(R)	If the equation of line touching both parabolas $y^2-4x=0$ and $x^2+32y=0$ is $ax-2y+b=0\ (a, b\in R)$, then $(a + b)$ is equal to	**3**	2
(S)	If the mid-point of a chord of the ellipse $\frac{x^2}{16}+\frac{y^2}{25}=1$ is M(0, 3) and the length of chord is $\frac{8p}{5}$, then p is equal to	**4**	1

Codes :

	P	Q	R	S		P	Q	R	S
(A)	4	3	2	1	**(B)**	3	1	2	4
(C)	3	4	1	2	**(D)**	4	3	1	2

SPACE FOR ROUGH WORK

20. MATCH THE FOLLOWING:

	Column I		Column II
(P)	Let z, ω, α be complex numbers such that $\|z\| = \|\omega\| = 4$ and $\alpha = \frac{z - \bar{\omega}}{16 + z\bar{\omega}}$, then $Re(\alpha)$ is equal to	**1**	0
(Q)	If $x = p + iq$ is a complex number such that $x^2 = 3 + 4i$ and $x^3 = 2 + 11i$ where $i = \sqrt{-1}$, then $(p + q)$ is equal to	**2**	3
(R)	Number of complex numbers z satisfying the equation $\bar{z} = iz^2$, where $i = \sqrt{-1}$ is equal to	**3**	4
(S)	If $z \in C$ satisfies $\|z + 2 - i\| = 5$ then the maximum value of $\frac{\|3z + 9 - 7i\|}{4}$ is equal to	**4**	5

Codes :

	P	Q	R	S		P	Q	R	S
(A)	4	3	2	1	**(B)**	1	2	4	3
(C)	1	2	3	4	**(D)**	2	1	3	4

SPACE FOR ROUGH WORK

End of Mock JEE Advanced-2/PAPER-2