Resonance®
Educating for better tomorrow

JEE (Main)

PAPER-1 (B.E./B. TECH.)

2023

COMPUTER BASED TEST (CBT)

Questions & Solutions

Date: 30 January, 2023 (SHIFT-1) | TIME : (9.00 a.m. to 12.00 p.m)

Duration: 3 Hours | Max. Marks: 300

SUBJECT: CHEMISTRY

Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | **FAX No. :** +91-022-39167222

To Know more : sms **RESO** at **56677** | **Website :** www.resonance.ac.in | **E-mail :** contact@resonance.ac.in | **CIN :** U80302RJ2007PLC024029

Toll Free : 1800 258 5555 **7340010333** facebook.com/ResonanceEdu twitter.com/ResonanceEdu www.youtube.com/resowatch blog.resonance.ac.in

PART : CHEMISTRY

31. For OF_2 molecule consider the following :

A. Number of lone pairs on oxygen is 2.

B. FOF angle is less than 104.5°.

C. Oxidation state of O is –2.

D. Molecule is bent V' shaped.

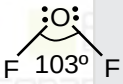
E. Molecular geometry is linear.

correct options are:

(1) A, C, D only (2) C, D, E only (3) B, E, A only (4) A, B, D only

NTA. (4)

RESO. (4)

Sol.  (Bent shape)

Oxidation number of oxygen is +2.

32. Lithium aluminium hydride can be prepared from the reaction of :

(1) LiH and $Al(OH)_3$ (2) LiCl and Al_2H_6 (3) LiCl Al and H_2 (4) LiH and Al_2Cl_6

NTA. (4)

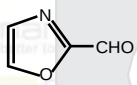
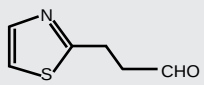
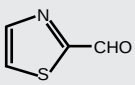
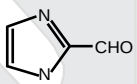
RESO. (4)

Sol. $8LiH + Al_2Cl_6 \longrightarrow 2LiAlH_4 + 6LiCl$

33. Which of the following compounds would give the following set of qualitative analysis?

(i)) Fehlings Test : Positive

(ii) Na fusion extract upon treatment with sodium nitroprusside gives a blood red colour but not prussian blue.

(1)  (2)  (3)  (4) 

NTA. (2)

RESO. (2)

Sol. Fehling test given by aldehyde but not aromatic aldehyde and if N and S attached with carbon atom give blood red with sodium nitroprusside gives a blood ted colour but not prussian blue.

34. During the qualitative analysis of SO_3^{2-} using dilute H_2SO_4, SO_2 gas is evolved which turns $K_2Cr_2O_7$ solution (acidified with dilue H_2SO_4) :

(1) red (2) blue (3) green (4) black

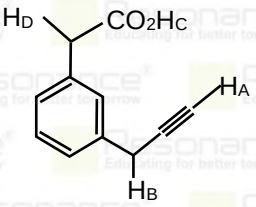
NTA. (3)

RESO. (3)

Sol. $Cr_2O_7^{-2} + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$

(Orange Red) (Green)

35. What is the correct order of acidity of the protons marked A–D in the given compounds?



(1) $H_C > H_D > H_A > H_B$ (2) $H_C > H_D > H_B > H_A$ (3) $H_C > H_A > H_D > H_B$ (4) $H_D > H_C > H_B > HA$

NTA. (1)

RESO. (1)

Sol. (–COOH) carboxylic acid is more acidic than alcohol or terminal alkyne. $K_a = H_C > H_D > H_A > H_B$.

36. Formation of photochemical smog involves the following reaction in which A, B and C are respectively.

(i) $NO_2 \xrightarrow{h\nu} A + B$

(ii) $B + O_2 \longrightarrow C$

(iii) $A + C \longrightarrow NO_2 + O_2$

Choose the correct answer from the options given below :

(1) N, O_2 & O_3 (2) NO, O & O_3 (3) O, NO_2 & NO (4) O, NO & NO_3^-

NTA. (2)

RESO. (2)

Sol. (i) $NO_2 \xrightarrow{h\nu} NO^\bullet + O^\bullet$

(A) (B)

(ii) $O^\bullet + O_2 \longrightarrow O_3$

(B) (C)

(iii) $NO^\bullet + O_3 \longrightarrow NO_2 + O_2$

(A) (C)

37. Amongst the following compounds, which one is an antacid ?

(1) Ranitidine (2) Broinpheniramine (3) Terfenadine (4) Meprobamate

NTA. (1)

RESO. (1)

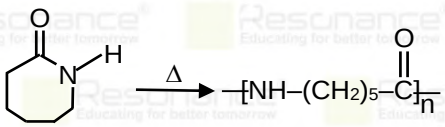
Sol. Ranitidine is an antacid. It is an antihistamine and decreases the reaction of gastric juice in stomach.

38. Caprolactam when heated at high temperature in presence of water, gives

(1) Dacron (2) Nylon 6 (3) Teflon (4) Nylon-6,6

NTA. (2)

RESO. (3)

Sol. 

Caprolactam Nylon-6

39. Which of the following is correct order of ligand field strength?

(1) $S^{2-} < NH_3 < en < CO < C_2O_4^{2-}$ (2) $NH_3 < en < CO < S^{2-} < C_2O_4^{2-}$

(3) $CO < en < NH_3 < C_2O_4^{2-} < S^{2-}$ (4) $S^{2-} < C_2O_4^{2-} < NH_3 < en < CO$

NTA. (4)

RESO. (4)

Sol. From spectro chemical series the increasing order of field strength of ligands is :

$I^- < Br^- < SCN^- < Cl^- < S^{2-} < F^- < OH^- < C_2O_4^{2-} < H_2O$

$NCS^- < edta^{4-} < NH_3 < en < CN^- < CO$.

40. In the wet tests for identification of various cations by precipitation, which transition element cation doesn't belong to group IV in qualitative inorganic analysis ?

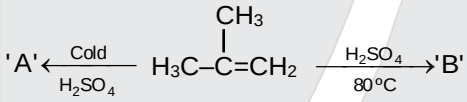
(1) Zn^{2+} (2) Fe^{3+} (3) Ni^{2+} (4) Co^{2+}

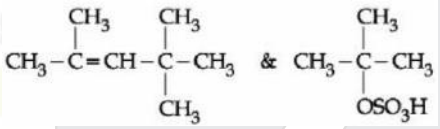
NTA. (2)

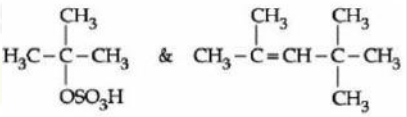
RESO. (2)

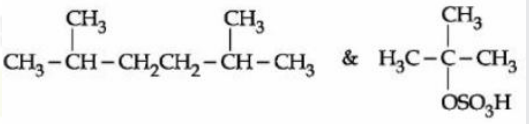
Sol. Group IV cations are: Zn^{2+}, Mn^{2+}, Co^{2+} and Ni^{2+}, Fe^{3+} belongs to group III.

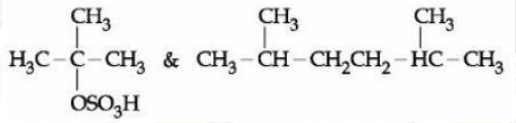
41. The major products 'A' and 'B' respectively, are



(1) 

(2) 

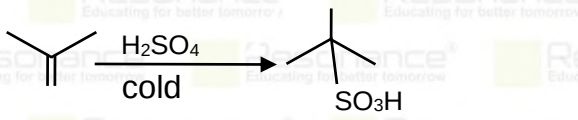
(3) 

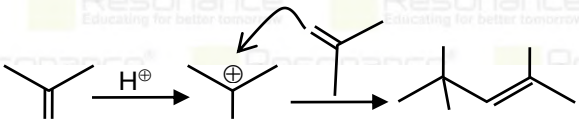
(4) 

NTA. (2)

RESO. (2)

Sol.





42. Match **List-I** with **List-II**

	List-I (Molecules/ions)		**List-II (No. of lone pairs of e^- on central atom)**
(A)	IF_7	(I)	Three
(B)	ICl_4^-	(II)	One
(C)	XeF_6	(III)	Two
(D)	XeF_2	(IV)	Zero

Choose the **correct** answer from the options given below :

(1) A – IV ; B – I ; C – II ; D – III

(2) A – II ; B – I ; C – IV ; D – III

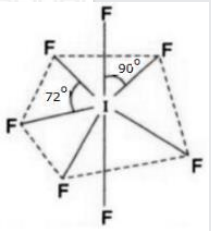
(3) A – II ; B – III ; C – IV ; D – I

(4) A – IV ; B – III ; C – II ; D – I

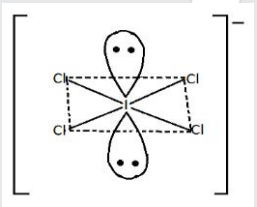
NTA. (4)

RESO. (4)

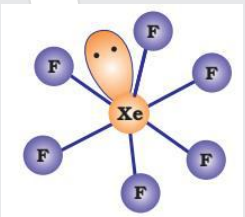
Sol.



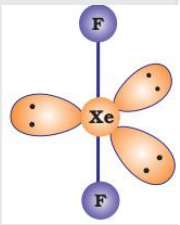
IF_7



ICl_4^-



XeF_6



XeF_2

43. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): Ketoses give Seliwanoff's test faster than Aldoses.

Reason (R) : Ketoses undergo β-elimination followed by formation of furfural.

In the light of the above statements, choose the correct answer from the options given below:

(1) **Both (A)** and **(R)** are true but **(R)** is **not** the correct explanation of **(A)**

(2) **(A)** is false but **(R)** is true

(3) **(A)** is true but **(R)** is false

(4) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

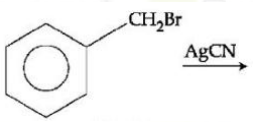
NTA. (3)

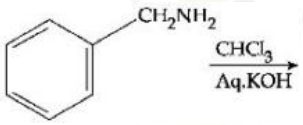
RESO. (3)

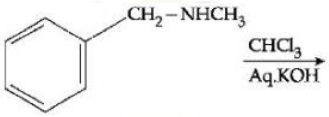
Sol. **Statement-1:** Ketose-(example Fructose) gives fiery red solution at faster rate than aldose

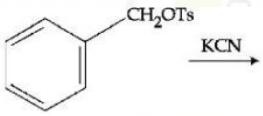
Statement-2: Ketose on dehydration with acid (HCl) give furfural which on further heating with resorcinol give red colour in Seliwanoff's test.

44. Benzyl isocyanide can be obtained by :

(1) 

(2) 

(3) 

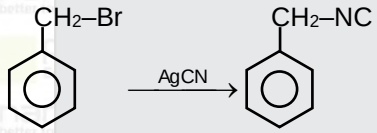
(4) 

Choose the correct answer from the options given below:

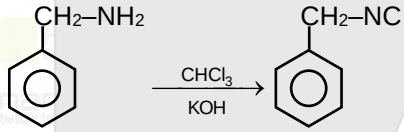
(1) Only B (2) B and C (3) A and B (4) A and D

NTA. (3)

RESO. (3)

Sol. (A) 

[SN^2 mechanism]

(B) 

[Isocyanide Test]

45. In the extraction of copper, its sulphide ore is heated in a reverberatory furnace after mixing with silica to:

(1) remove FeO as $FeSiO_3$

(2) separate CuO as $CuSiO_3$

(3) decrease the temperature needed for roasting of Cu_2S

(4) remove calcium as $CaSiO_3$

NTA. (1)

RESO. (1)

Sol. The ore is heated in a reverberatory furnace after mixing with silica. In the furnace, iron oxide 'slags off as iron silicate

$FeO + SiO_2 \longrightarrow FeSiO_3$ (slag)

46. The alkaline earth metal sulphate(s) which are readily soluble in water is/are :

A. $BeSO_4$

B. $MgSO_4$

C. $CaSO_4$

D. $SrSO_4$

E. $BaSO_4$

Choose the **correct** answer from the options given below :

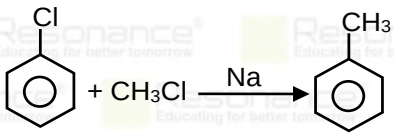
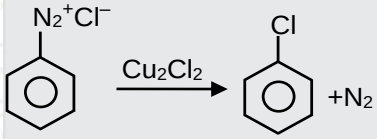
(1) A and B (2) A only (3) B only (4) B and C

NTA. (1)

RESO. (1)

Sol. $BeSO_4$ and $MgSO_4$ are readily soluble in water. The greater hydration enthalpies of Be^{2+} and Mg^{2+} ions overcome the lattice enthalpy factor and hence sulphates of Be^{+2} & Mg^{+2} are soluble in water.

47. Match **List-I** with **List-II**

	List-I		List-II
(A)		(I)	Fitting reaction
(B)		(II)	Wurtz Fitting reaction
(C)		(III)	Finkelstein reaction
(D)	$C_2H_5Cl + NaI \rightarrow C_2H_5I + NaCl$	(IV)	Sandmeyer reaction

Choose the **correct** answer from the options given below :

(1) (A)-(III), (B)-(II), (C)-(IV), (D)-(I)

(2) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)

(3) (A)-(IV), (B)-(II), (C)-(III), (D)-(I)

(4) (A)-(II), (B)-(I), (C)-(III), (D)-(IV)

NTA. (2)

RESO. (2)

Sol. Alkylhalide $\xrightarrow[\text{ether}]{Na}$ alkane $\rightarrow$ Wurtz reaction

Arylhalide $\xrightarrow[\text{ether}]{Na}$ Aromatic hydrocarbon $\rightarrow$ Fitting reaction

Alkylhalide + Arylhalide $\xrightarrow[\text{ether}]{Na}$ alkane $\rightarrow$ Wurtz Fitting reaction

$PhN_2Cl \xrightarrow{Cu_2Cl_2}$ Sandmeyer reaction

48. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) : In expensive scientific instruments, silica gel is kept in watch-glasses or in semipermeable membrane bags.

Reason (R) : Silica gel adsorbs moisture from air via adsorption, thus protects the instrument from water corrosion (rusting) and/or prevents malfunctioning.

In the Light of the above statements, choose the correct answer from the options given below :

(1) **Both (A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

(2) **Both (A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**

(3) **(A)** is false but **(R)** is true

(4) **(A)** is true but **(R)** is false

NTA. (1)

RESO. (1)

Sol. Silica gel adsorbs moisture from air via adsorption, thus protects the instrument from water corrosion (rusting) and/or prevents malfunctioning.

49. To inhibit the growth of tumours, identify the compounds used from the following:

A. EDTA

B. Coordination Compounds of Pt

C. D - Penicillaniùie

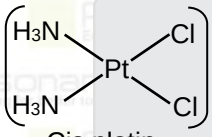
D. Cis - Platin

Choose the correct answer from the option given below:

(1) A and C Only (2) B and D Only (3) A and B Only (4) C and D Only

NTA. (2)

RESO. (2)

Sol. 

Cis platin used to inhibit the growth of tumors.

50. Match **List-I** with **List-II**

List-I (Atomic Number)		List-II (Block of periodic table)	
(A)	37	(I)	p-block
(B)	78	(II)	d-block
(C)	52	(III)	f-block
(D)	65	(IV)	s-block

(1) A – IV ; B – II ; C – I ; D – III (2) A – IV ; B – III ; C – II ; D – I

(3) A – I ; B – III ; C – IV ; D – II (4) A – II ; B – IV ; C – I ; D – III

NTA. (1)

Reso. (1)

Sol.

Atomic number	Electronic configuration	Block
(A) Z = 37 (K)	$[_{36}Kr]\ 5s^1$	s-block
(B) Z = 78 (Pt)	$[_{54}Xe]\ 4f^{14}\ 6s^2\ 6d^8$	d-block
(C) Z = 52 (Te)	$[_{36}Kr]\ 4f^{10}\ 5s^2\ 5p^4$	p-block
(D) Z = 65 (Tb)	$[Xe]\ 4f^9\ 6s^2$	f-block

51. A trisubstituted compound 'A' $C_{10}H_{12}O_2$ gives neutral $FeCl_3$ test positive. Treatment of compound 'A' with NaOH and CH_3Br gives $C_{11}H_{14}O_2$, with hydroiodic acid gives methyl iodide and with hot conc. NaOH gives a compound B, $C_{10}H_{12}O_2$, Compound 'A' also decolorises alkaline $KMnO_4$.

The number of π bond/s present in the compound 'A' is _____ .

NTA. (4)

RESO. (4)

Sol. $C_{10}H_{12}O_2$, DU = 5 (1-phenyl ring present with unsaturation in side alkyl chain)

Given information: neutral $FeCl_3$ test positive $\rightarrow$ Phenol present

Compound 'A' also decolorises alkaline $KMnO_4$ $\rightarrow$ unsaturation in side alkyl chain

Number of π-bond/s present in the compound 'A' is 4.

52. When 2 litre of ideal gas expands isothermally into vacuum to a total volume of 6 litre, the change in internal energy is _____J. (Nearest integer) **[PC-TDS-HIE-M-XI]**

NTA. **(0)**

RESO. **(0)**

Sol. $\Delta U = \frac{F}{2} nR\Delta T$ (where F = degree of freedom)

as process is isothermal so $\Delta T = 0$

so $\Delta U = 0$

53. A solution containing 2 g of a non-volatile solute in 20 g of water boils at 373.52 K. The molecular mass of the solute is _____ g mol^{-1}. (Nearest integer) **[PC-SCP-EBP-E-XII]**

Given, water boils at 373 K, K_b for water = 0.52 K kg mol^{-1}

NTA. **(100)**

RESO. **(100)**

Sol. $\Delta T_b = k_b m$

$$(373.52 - 373) = 0.52 \times \left(\frac{2\times1000}{M\times20}\right)$$

$$M = \frac{2\times1000}{20} = 100 \text{ g/mol}$$

Molecular mass of solute = 100 gm/mol.

54. Consider the cell

$Pt(s)|H_2$ (g, 1 atm)$|H^+$ (aq,1 M)$||$ $Fe^{3+}(aq)$, $Fe^{2+}(aq)|Pt(s)$

When the potential of the cell is 0.712 V at 298 K, the ratio $[Fe^{2+}$ $[Fe^{3+}]$ is _____ .

(Nearest integer)

Given: $Fe^{3+} + e^- \rightleftharpoons Fe^{2+}$, E^0Fe^{3+}, $Fe^{2+}|Pt = 0.771$

$$\frac{2.303RT}{F} = 0.06V$$

NTA. **(10)**

RESO. **(10)**

Sol. $Pt(s)|H_2$ (g, 1 atm)$|H^+$ (aq,1 M)$||$ $Fe^{3+}(aq)$, $Fe^{2+}(aq)|Pt(s)$

At anode: $H_2 \longrightarrow 2H^+ + 2e^-$

At cathode: $(Fe^{3+}(aq) + e^- \longrightarrow Fe^{2+}(aq) \times 2$

overall cell reaction : $H_2(g) + 2Fe^{3+} \longrightarrow 2H^+(aq) + 2Fe^{2+}(aq)$

$E^o_{cell} = E^o_{cathode} - E^o_{Anode} = 0.771 - 0 = 0.771$ V

$$E^o_{cell} = E^o_{cell} - \frac{0.06}{n}\log\frac{[Fe^{2+}][H^+]^2}{P_{H_2}\cdot[Fe^{3+}]^2}$$

$$0.712 = 0.771 - \frac{0.06}{2}\log\frac{[Fe^{2+}]^2}{[Fe^{3+}]^2}$$

$$\log\frac{[Fe^{2+}]}{[Fe^{3+}]} = \frac{0.771-0.712}{0.06} = 1$$

$$\therefore \frac{[Fe^{2+}]}{[Fe^{3+}]} = 10$$

55. The energy of one mole of photons of radiation of frequency 2×10^{12} Hz in J mol^{-1} is _____. (Nearest integer)

[Given: $h = 6.626 \times 10^{-34}$ Js

$N_A = 6.022 \times 10^{23}$ mol^{-1}]

NTA. (798)

RESO. (798)

Sol. $E = nh\nu$

For one mole photons (E) = $6.022 \times 10^{23} \times 6.626 \times 10^{-34} \times 2 \times 10^{12}$

= 798.03 J

56. 600 mL of 0.0 1M HCl is mixed with 400 mL of 0.01 M H_2SO_4. The pH of the mixture is _____ . $\times 10^{-2}$. (Nearest integer)

[Given log 2 = 0.30

log 3 = 0.48

log 5 = 0.69

log 7 = 0.84

log 11 = 1.04

NTA. (186)

RESO. (186)

Sol.

	$HCl \longrightarrow$	$H^+ + Cl^-$
Milli moles	0.01×600	6
	$H_2SO_4 \longrightarrow$	$2H^+ + SO_4^{-2}$
Milli moles	0.01×400	$2\times4=8$

$$[H^+] = \frac{8+6}{1000} = 14 \times 10^{-3}$$

$pH = -\log(14 \times 10^{-3})$

$= 3 - \log 14$

$= 3 - \log(2 \times 7)$

$= 3 - \log 2 - \log 7$

$= 3 - 0.30 - 0.84$

$= 1.86 = 186 \times 10^{-2}$

57. Some amount of dichloromethane (CH_2Cl_2) is added to 671.141 mL of chloroform ($CHCl_3$) to prepare 2.6×10^{-3} M solution of CH_2Cl_2 (DCM). The concentration of DCM is _____. ppm (by mass).
Given : atomic mass : C = 12, H = 1, Cl = 35.5 density of $CHCl_3$ = 1.49 g cm^{-3}

NTA. (221)

RESO. (148)

Sol. Molarity = $\frac{W \times 1000}{M_W \times V}$

$2.6 \times 10^{-3} = \frac{W \times 1000}{85 \times 671.41}$

$W = \frac{2.6 \times 10^{-3} \times 85 \times 671.141}{1000} = 0.148$ g

Conc. of DCM (in ppm) = $\frac{0.148}{1.49 \times 671.141} \times 10^6 = 148$ ppm

58. If compound A reacts with B following first order kinetics with rate constant 2.011×10^{-3} s^{-1}. The time taken by A (in seconds) to reduce from 7 g to 2 g will be _____. (Nearest Integer)
[log 5 = 0.698, log 7 = 0.845, log 2 = 0.301]

NTA. (623)

RESO. (623)

Sol. $K = \frac{1}{t}\ln\left(\frac{a}{a-x}\right)$

$K = \frac{1}{t}\ln\left(\frac{w_0}{w_t}\right)$

$t = \frac{1}{K}\ln\left(\frac{7}{2}\right)$

$t = \frac{2.303}{K}[\log 7 - \log 2]$

$= \frac{2.303}{K}[0.845 - 0.301]$

$= \frac{2.303}{2.011 \times 10^{-2}} \times 0.544 = 622.989$ sec

59. The number of electrons involved in the reduction of permanganate to manganese dioxide in acidic medium is _____ .

NTA. (3)

RESO. (3)

Sol. $\overset{+7}{MnO_4^-} + 4H^+ + 3e^- \longrightarrow \overset{+4}{MnO_2} + 2H_2O$

Number of electrons involved in this reaction is 3.

60. A 300 mL bottle of soft drink has 0.2 M CO_2 dissolved in it. Assuming CO_2 behaves as an ideal gas, the volume of the dissolved CO_2 at STP is _____ mL. (Nearest integer)

Given : At STP, molar volume of an ideal gas is 22.7 L mol^{-1}

NTA. (1362)

RESO. (1362)

Sol. Number of mole of $CO_2 = M \times V \times 10^{-3}$

$= 0.2 \times 300 \times 10^{-3}$

$= 0.06$ mole

Volume of CO_2 (at STP) $= 0.06 \times 22.7$

$= 1.362$ L

$= 1362$ mL

Resonance®
Educating for better tomorrow

TO KNOW MORE
Call: 0744-2777777, 8441024095

TARGET: JEE (ADV.) 2023

Polish your subject knowledge with the guidance of
Top Notch Sr. Faculty of Resonance

SPARK

15 WEEKS COMPAC COURSE

OFFLINE / ONLINE

CLASS STARTS
6th FEBRUARY 2023

ACADEMIC FEATURES

- Course Duration: **15** Weeks
- Total No. of Lectures: **234** (P: 78 | C: 78 | M: 78)
- Duration of One Lecture: **1.5 hrs.** (90 Minutes)
- Classroom Teaching Hours.: **351** Hrs.
- Testing Duration: **60** Hrs.
- Total Academic Hours.: **411** Hrs.

Course Features

- Study Material
- Doubt Classes
- Back up support of recorded lectures
- Part/ Full Syllabus Test Series

Facilities for Offline Students

- In-house Computer Lab
- Self Study Rooms for Boys & Girls

TARGET: JEE (Main) 2023

Boost your Percentile with

PERCENTILE BOOSTER COURSE

8 WEEKS COMPAC COURSE

OFFLINE / ONLINE

CLASS STARTS
6th FEBRUARY 2023

COURSE FEATURES

- Complete Course Coverage
- 25 Chapter wise Test
- Regular Practice through 33 Daily Online Practice Test
- 5 Full Syllabus Test
- 3 Joint Preparatory Test
- Approx 2500 practice Que.
- 113 Teaching hours
- 99 Testing Hours
- Regular Test discussion classes for concept clearance
- Back up support of recorded lectures

Resonance®
Educating for better tomorrow

JEE (ADVANCED) 2022 RESULT

RESONites ने फिर लहराया सफलता का परचम

STUDENTS FROM CLASSROOM PROGRAM (OFFLINE/ ONLINE)

AIR 6

AIR-1 GEN-EWS

KARTHIKEYA POLISETTY
Roll No.: 21925115

AIR 8

DHEERAJ KURUKUNDA
Roll No.: 21925114

Students in TOP-100 All India Ranks (AIRs)

AIR-11
DEEVYANSHU MALU
Roll No.: 21219044

AIR-15
ABHIJEET ANAND
Roll No.: 21925116

AIR-35
SANSKAR SHAURYA
Roll No.: 21925113

AIR-50
ANIRUDH GARG
Roll No.: 21220122

AIR-54
SOUMITRA D. NAYAK
Roll No.: 21220554

AIR-58
KANISHK SHARMA
Roll No.: 21220454

ADMISSIONS OPEN FOR ACADEMIC SESSION 2023-24

TARGET: JEE (Adv.) 2024
for Class XII Passed Student
VISHESH COURSE
MODE: OFFLINE / ONLINE
CLASS STARTS 10th & 17th April

TARGET: JEE (Main) 2024
for Class XII Passed Student
ABHYAAS COURSE
MODE: OFFLINE / ONLINE
CLASS STARTS 10th & 24th April

SCHOLARSHIP ON THE BASIS OF JEE (MAIN) 2023 %ILE / AIR

Resonance Eduventures Limited
REGISTERED & CORPORATE OFFICE: CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Rajasthan) - 324005
Tel. No.: 0744-2777777, 2777700 | **CIN:** U80302RJ2007PLC024029

Social Media Connect

83067 41444 | youtube.com/@ResonanceEdu | t.me/OfficialResonance
facebook.com/ResonanceEdu | instagram.com/resonance_edu | in.linkedin.com/school/resonance-eduventures-ltd/ | twitter.com/ResonanceEdu