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# JEE

## (Main)

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

# 2023

## COMPUTER BASED TEST (CBT) Questions & Solutions

**Date: 25 January, 2023 (SHIFT-2) | TIME : (3.00 p.m. to 6.00 p.m.)**

**Duration: 3 Hours | Max. Marks: 300**






**SUBJECT: CHEMISTRY**

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**PART : CHEMISTRY**

31. Given below are two statements:

**Statement I:** In froth floatation method a rotating paddle agitates the mixture to drive air out of it.

**Statement II:** Iron pyrites are generally avoided for extraction of iron due to environmental reasons.

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

- (1) Both Statement I and statement II are false
- (2) Both Statement I and statement II are true
- (3) Statement I is false but statement II is true
- (4) Statement I is true but statement II is false.

NTA. (3)

RESO. (3)

Sol. Theory Based

32. Match List I with List II

|    | List I (Amines)        |      | List I ( $pK_b$ ) |
|----|------------------------|------|-------------------|
| A. | Aniline                | I.   | 3.25              |
| B. | Ethanamine             | II.  | 3.00              |
| C. | N-Ethylethanamine      | III. | 9.38              |
| D. | N, N-Diethylethanamine | IV.  | 3.29              |

Choose the correct answer from the options given below:

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

NTA. (1)

RESO. (1)

Sol. Greater the basic strength, smaller the  $pK_b$  value.

33. A. Ammonium salts produce haze in atmosphere.  
 B. Ozone gets produced when atmospheric oxygen reacts with chlorine radicals.  
 C. Polychlorinated biphenyls act as cleansing solvents.  
 D. 'Blue baby' syndrome occurs due to the presence of excess of sulphate ions in water.

Choose the correct answer from the options given bellows :

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

NTA. (2)

RESO. (2)

Sol. It is fact.

34. Match List I with List II

|    | List I (Name of polymer) |      | List I (use)        |
|----|--------------------------|------|---------------------|
| A. | Glyptal                  | I.   | Flexible pipes      |
| B. | Neoprene                 | II.  | Synthetic wool      |
| C. | Acrlan                   | III. | Paints and Lacquers |
| D. | LDP                      | IV.  | Gaskets             |

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

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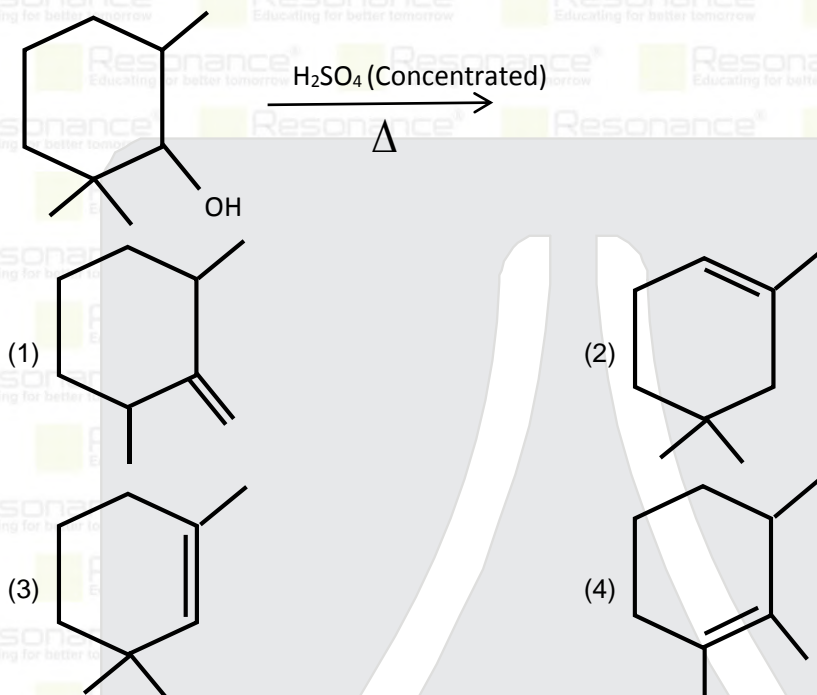
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NTA. (2)

RESO. (2)

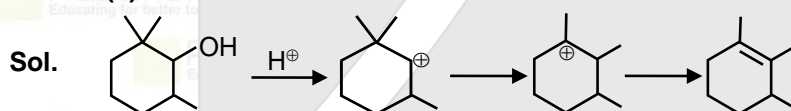
Sol. Fact

35. Find out the major product from the following reaction.



NTA. (4)

RESO. (4)



36. Given below are two statements, one is labelled as **Assertion A** and other is labelled as **Reason R**  
**Assertion A:** The alkali metals and their salts impart characteristic colour to reducing flame.

**Reason R:** Alkali metals can be detected using flame tests.

In the light of the above statements, choose the most appropriate answer from the options given below

- (1) A is not correct but R is correct
- (2) Both A and R are correct but R is NOT the correct explanation of A
- (3) Both A and R are correct and R is the correct explanation of A
- (4) A is correct but R is not correct

NTA. (1)

RESO. (1)

Sol. Theory Based

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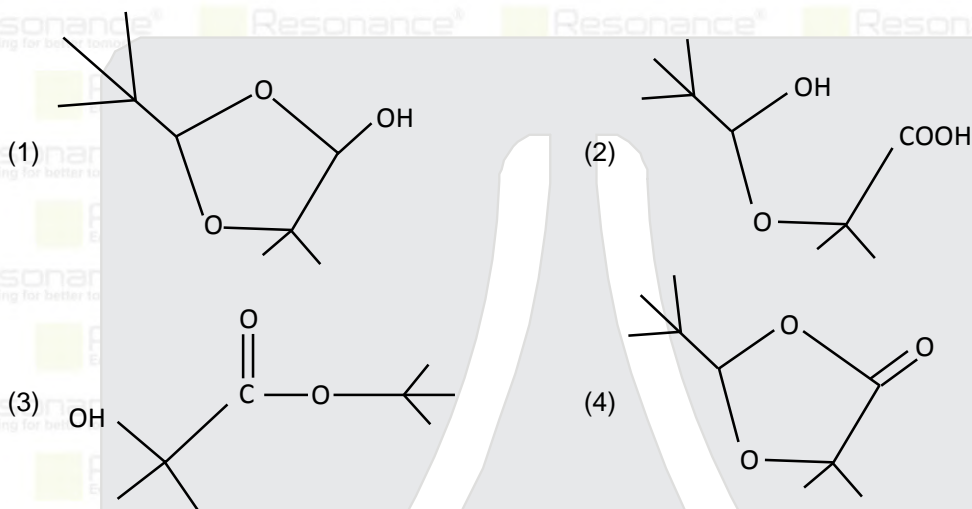
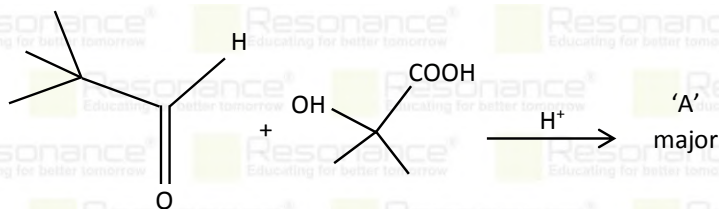
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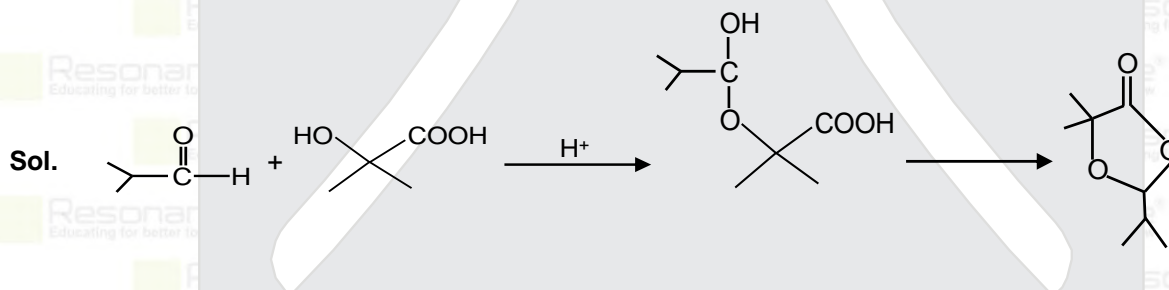
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37. 'A' in the given reaction is



NTA. (4)  
RESO. (4)



38. Match List I with List II

| List I |                 | List II |   |
|--------|-----------------|---------|---|
| A.     | Cobalt catalyst | I.      | (H <sub>2</sub> +Cl <sub>2</sub> ) production |
| B.     | Syngas          | II.     | Water gas production                          |
| C.     | Nickel catalyst | III.    | Coal gasification                             |
| D.     | Brine solution  | IV.     | Methanol production                           |

Choose the correct answer from the options given below:

- (1) A-IV, B-III, C-I, D-II      (2) A-II, B-III, C-IV, D-I  
(3) A-IV, B-I, C-II, D-III      (4) A-IV, B-III, C-II, D-I

NTA. (4)  
RESO. (4)

Sol. Theory Based.

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39. Given below are two statements, one is labelled as **Assertion A** and other is labelled as **Reason R**  
**Assertion A:** Carbon forms two important oxides –CO and CO<sub>2</sub>. CO is neutral whereas CO<sub>2</sub> is acidic in nature

**Reason R:** CO<sub>2</sub> can combine with water in a limited way to form carbonic acid, while CO is sparingly soluble in water.

In the light of the above statements, choose the most appropriate answer from the options given below

- (1) A is not correct but R is correct  
 (2) Both A and R are correct but R is NOT the correct explanation of A  
 (3) Both A and R are correct and R is the correct explanation of A  
 (4) A is correct but R is not correct

NTA. (3)

RESO. (3)

Sol. (i) CO<sub>2</sub> is acidic as it form carbonic acid.



(ii) CO is almost insoluble in water.

40. Match List I with List II

|    | List I<br>Coordination entity                        |      | List II<br>Wavelength of light absorbed in nm |
|----|--|------|---|
| A. | [CoCl(NH <sub>3</sub> ) <sub>5</sub> ] <sup>2+</sup> | I.   | 310   |
| B. | [Co(NH <sub>3</sub> ) <sub>6</sub> ] <sup>3+</sup>   | II.  | 475   |
| C. | [Co(CN) <sub>6</sub> ] <sup>3-</sup>                 | III. | 535   |
| D. | [Cu(H <sub>2</sub> O) <sub>4</sub> ] <sup>2+</sup>   | IV.  | 600   |

Choose the correct answer from the options given below:

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

NTA. (1)

RESO. (1)

Sol.  $\Delta_o \uparrow \lambda \downarrow \left\{ \Delta_o = \frac{\lambda c}{\lambda} \right\}$

41. What is the mass ratio of ethylene glycol (C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>, molar mass=62 g/mol) required for making 500 g of 0.25 molal aqueous solution and 250 mL of 0.25 molal aqueous solution?

- (1) 1:2                      (2) 1:1                      (3) 3:1                      (4) 2:1

NTA. (4)

RESO. (4)

Sol.  $\frac{\text{Milimoleof Ist case}}{\text{Milimoleof IIndcase}} = \frac{500 \times 0.25}{250 \times 0.25} = \frac{2}{1}$   
 2 : 1

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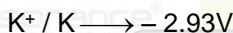
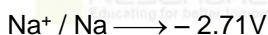
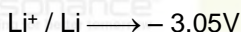
42. Which one among the following metals is the weakest reducing agent?

- (1) Rb (2) Na (3) Li (4) K

NTA. (2)

RESO. (2)

Sol. According to electrochemical series



43. Potassium dichromate acts as a strong oxidizing agent in acidic solution. During this process, the oxidation state changes from

- (1) +6 to +3 (2) +6 to +2 (3) +3 to +1 (4) +2 to +1

NTA. (1)

RESO. (1)



44. Match List I with List II

|    | List I<br>Isometric pairs           |      | List II<br>Type of isomers |
|----|-------------------------------------|------|----------------------------|
| A. | Propanamine and N-/methylethanamine | I.   | Metamers                   |
| B. | Hexan-2-one and Hexan-3-one         | II.  | Positional isomers         |
| C. | Ethanamide and Hydeoxyethanimine    | III. | Functional isomers         |
| D. | o-nitrophenol and p-nitrophenol     | IV.  | Tautomers                  |

Choose the correct answer from the options given below:

- (1) A-II, B-III, C-I, D-IV (2) A-III, B-I, C-IV, D-II  
(3) A-III, B-IV, C-I, D-II (4) A-IV, B-III, C-I, D-II

NTA. (2)

RESO. (2)

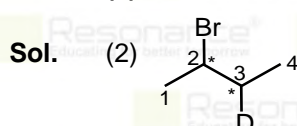
Sol. Based on definition of positional, functional, Metamers and Tautomers form of isomerism.

45. The isomeric deuterated bromide with molecular formula  $\text{C}_4\text{H}_8\text{DBr}$  having two chiral carbon atoms is

- (1) 2 – Bromo –1 – deuterobutane  
(2) 2 – Bromo –2 – deuterobutane  
(3) 2 – Bromo –3 – deuterobutane  
(4) 2 – Bromo –1 – deuteron – 2 – methylpropane

NTA. (3)

RESO. (3)



2-Bromo-3-duterobutane

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46. When the hydrogen ion concentration  $[H^+]$  changes by a factor of 1000, the value of pH of the solution

- (1) decreases by 3 units (2) decreases by 2 units  
(3) increases by 3 units (4) increases by 1000 units

NTA. (3)

RESO. (3)

Sol.  $(pH)_1 = -\log C$

$$(pH)_2 = -\log 10^3 C = -[\log 10^3 + \log C]$$

$$= -3 - \log C$$

$$(pH)_2 - (pH)_1 = -3$$

$\Rightarrow$  Decreased by 3

47. **Statement I:** Dipole moment is a vector quantity and by convention it is depicted by a small arrow with tail on the negative centre and head pointing towards the positive centre.

**Statement II:** The crossed arrow of the dipole moment symbolizes the direction of the shift of charges in the molecules.

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

- (1) Both Statement I and Statement II are correct.  
(2) Statement I is correct but statement II is incorrect.  
(3) Statement I is incorrect but statement II is correct.  
(4) Both Statement I and Statement II are incorrect.

NTA. (2)

RESO. (4)

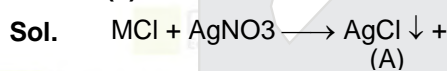
Sol. Theory Based

48. A chloride salt solution acidified with dil  $HNO_3$  gives a curdy white precipitate, [A] on addition of  $AgNO_3$ . [A] on treatment with  $NH_4OH$  gives a clear solution B. A and B are respectively.

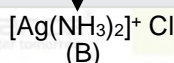
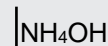
- (1)  $H[AgCl_3]$  &  $(NH_4)[Ag(OH)_2]$  (2)  $H[AgCl_3]$  &  $[Ag(NH_3)_2]Cl$   
(3)  $AgCl$  &  $[Ag(NH_3)_2]Cl$  (4)  $AgCl$  &  $(NH_4)[Ag(OH)_2]$

NTA. (3)

RESO. (3)



(A)



(B)

49. Which of the following represents the correct order of metallic character of the given elements?

- (1)  $Be < Si < Mg < K$  (2)  $K < Mg < Be < Si$  (3)  $Be < Si < K < Mg$  (4)  $Si < Be < Mg < K$

NTA. (4)

RESO. (4)






Sol. According to electropositive character Si is having non metallic character

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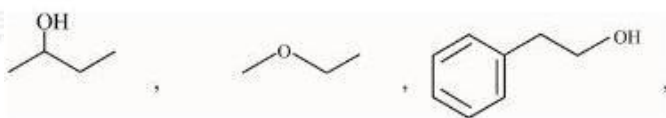
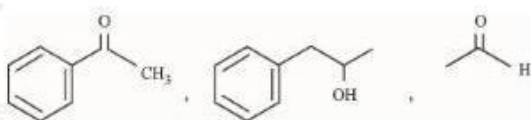
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50. Given below are two statements, one is labelled as **Assertion A** and other is labelled as **Reason R**  
**Assertion A:** Butylated hydroxy anisole when added to butter increases its shelf life.  
**Reason R:** Butylated hydroxy anisole is more reactive towards oxygen than food.  
 In the light of the above statements, choose the most appropriate answer from the options given below  
 (1) A is correct but R is not correct  
 (2) Both A and R are correct but R is NOT the correct explanation of A  
 (3) A is not correct but R is correct  
 (4) Both A and R are correct but R is the correct explanation of A

NTA. (4)  
 RESO. (4)

Sol. Fact NCERT-XII part-2 Page 458.

51. Number of compounds giving (i) red colouration with ceric ammonium nitrate and also (ii) positive iodoform test from the following is\_\_\_\_\_



NTA. (3)  
 RESO. (3)

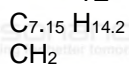
Sol. Only I, II, III gives iodoform test as well as red colour with

Ceric ammonium nitrate as they have  $\text{CH}_3\overset{\text{OH}}{\text{C}}\text{H}-$  group.

52. Number of hydrogen atoms per molecule of a hydrocarbon A having 85.8% carbon is \_\_\_\_\_  
 (Given: Molar mass of A= 84 g mol<sup>-1</sup>)

NTA. (12)  
 RESO. (12)

Sol. 
$$\text{C} = \frac{85.8}{12} \quad \text{H} = \frac{14.2}{1}$$



$n \times E_{\text{mass}} = M_{\text{mass}}$

$14 \times n = 84$

$n = 6$



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53. Pt(s) | H<sub>2</sub>(g) (1 bar) | H<sup>+</sup> (aq) (1 M) || M<sup>+3</sup>(aq), M<sup>+</sup>(aq) | Pt(s)

The E<sub>cell</sub> for the given cell is 0.1115 V at 298 K when  $\frac{[M^+(aq)]}{[M^{+3}(aq)]} = 10^a$

The value of a is \_\_\_\_\_

Given: E<sup>0</sup>M<sup>+3</sup>/M<sup>+</sup> = 0.2V

$$\frac{2.303RT}{F} = 0.059V$$

NTA. (3)

RESO. (3)

Sol.  $0.1115 = \frac{0.059}{2} \log \frac{[M^+]}{[M^{+3}]}$  or  $\frac{[M^+]}{[M^{+3}]} = 10^3$

54. The number of pairs of the solutions having the same value of the osmotic pressure from the following is \_\_\_\_\_. (Assume 100% ionization)

- A. 0.500 M C<sub>2</sub>H<sub>5</sub>OH (aq) and 0.25 M KBr (aq)
- B. 0.100 M K<sub>4</sub>[Fe(CN)<sub>6</sub>] (aq) and 0.100 M FeSO<sub>4</sub>(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> (aq)
- C. 0.05 M K<sub>4</sub>[Fe(CN)<sub>6</sub>] (aq) and 0.25 M NaCl (aq)
- D. 0.15 M NaCl (aq) and 0.1 M BaCl<sub>2</sub> (aq)
- E. 0.02 M KCl.MgCl<sub>2</sub>.6H<sub>2</sub>O (aq) and 0.05 M KCl (aq)

NTA. (4)

RESO. (4)

Sol.  $\pi \propto iC$

A, B, D and E

55. 28.0 L of CO<sub>2</sub> is produced on complete combustion of 16.8 L gaseous mixture of ethene and methane at 25°C and 1 atm. Heat evolved during the combustion process is \_\_\_\_\_. kJ.

Given:  $\Delta H_c(\text{CH}_4) = -900 \text{ kJ mol}^{-1}$

$\Delta H_c(\text{C}_2\text{H}_4) = -1400 \text{ kJ mol}^{-1}$

NTA. (925)

RESO. (925)

Sol.  $\text{CH}_4 + 2\text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

$\text{C}_2\text{H}_4 + 3\text{O}_2 \longrightarrow 2\text{CO}_2 + 2\text{H}_2\text{O}$

16.8-x                      2(16.8-x)

$x + 2(16.8 - x) = 28$

$\text{CH}_4 = x = 5.6 \text{ L}$

$\text{C}_2\text{H}_4 = 16.8 - 5.6 = 11.2 \text{ L}$

$$n_{\text{CH}_4} = \frac{5.6}{22.4} = \frac{1}{4}$$

$$n_{\text{C}_2\text{H}_4} = \frac{11.2}{22.4} = \frac{1}{2}$$

$$\begin{aligned} \therefore \text{Heat released} &= \frac{1}{4} \times 900 + \frac{1}{2} \times 1400 \\ &= 225 + 700 = 925 \text{ KJ} \end{aligned}$$

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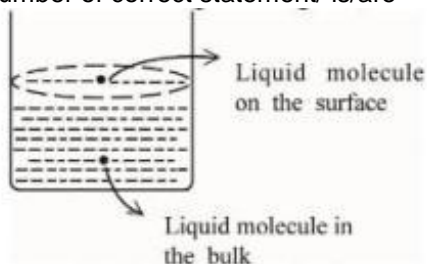
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56. Based on the given figure the number of correct statement/ is/are



- (1) Surface tension is the outcome of equal attractive and repulsive forces acting on the liquid molecule in bulk.
- (2) Surface tension is due to uneven forces acting on the molecules present on the surface.
- (3) The molecule in the bulk can never come to the liquid surface
- (4) The molecules on the surface are responsible for vapour pressure if the system is a closed system.

NTA. (2)

RESO. (2)

Sol. Theory Based 2 and 4

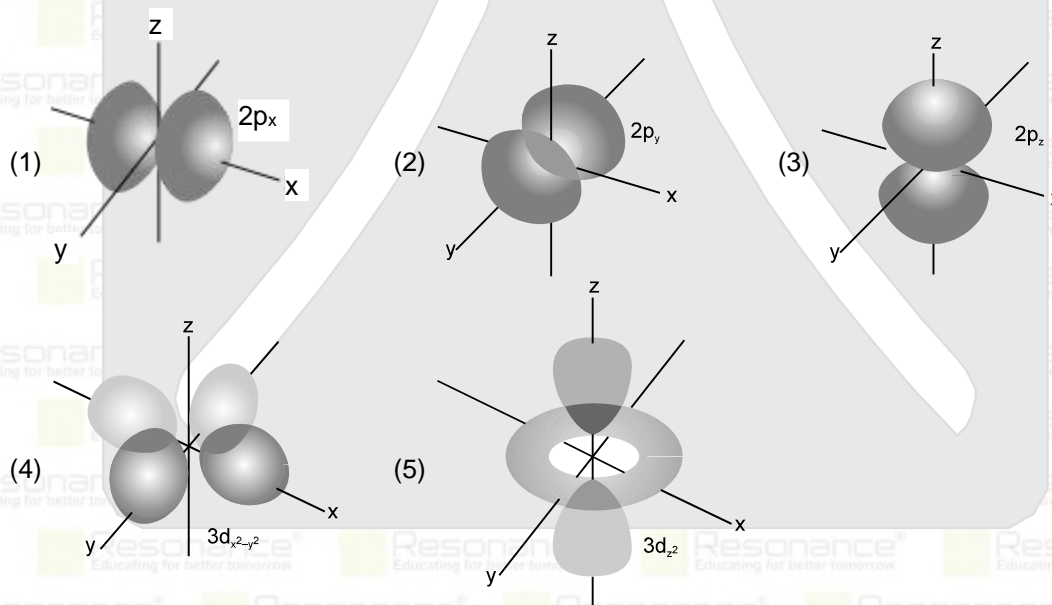
57. The number of given orbitals which have electron density along the axis is \_\_\_\_\_

$P_x, P_y, P_z, d_{xy}, d_{xz}, d_{z^2}, d_{x^2-y^2}$

NTA. (5)

RESO. (5)

Sol.  $p_x, p_y, p_z, d_{x^2-y^2}$  &  $d_{z^2}$  orbital (eg) are axial orbitals



58. The number of **incorrect** statement/s from the following is/are \_\_\_\_\_

- (1) Water vapours are adsorbed by anhydrous calcium chloride.
- (2) There is a decrease in surface energy during adsorption.
- (3) As the adsorption proceeds,  $\Delta H$  becomes more and more negative.
- (4) Adsorption is accompanied by decrease in entropy of the system.

NTA. (2)

RESO. (2)

Sol. Theory Based (1) and (3)

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59. A first order reaction has the rate constant,  $k = 4.6 \times 10^{-3} \text{ s}^{-1}$ . The number of **correct** statement/s from the following is/are \_\_\_\_\_

Given:  $\log 3 = 0.48$

- A. Reaction completes in 1000 s.
- B. The reaction has a half-life of 500 s.
- C. The time required for 10% completion is 25 times the time required for 90% completion.
- D. The degree of dissociation is equal to  $(1 - e^{-kt})$
- E. The rate and the rate constant have the same unit.

NTA. (2)

RESO. (2)

Sol. (C & D)

Statement 4 is correct

$$C_t = C_0 e^{-kt}$$

$$C_0 \rightarrow C_0 - C_t$$

$$1 \rightarrow \frac{C_0 - C_t}{C_0}$$

60. Total number of moles of AgCl precipitated on addition of excess of  $\text{AgNO}_3$  to one mole each of the following complexes  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$ ,  $[\text{Ni}(\text{H}_2\text{O})_6]\text{Cl}_2$ ,  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$  and  $[\text{Pd}(\text{NH}_3)_4]\text{Cl}_2$  is \_\_\_\_\_ .

NTA. (5)

RESO. (5)






Sol. Theory Based (PPT will occur by free  $\text{Cl}^-$  ions)

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for Class XII Passed Student

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MODE: OFFLINE / ONLINE

**CLASS STARTS 10<sup>th</sup> & 24<sup>th</sup> April**

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

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