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

## 2023

### COMPUTER BASED TEST (CBT) Memory Based Questions & Solutions

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Date: 31 January, 2023 (SHIFT-1) | TIME : (9.00 a.m. to 12.00 p.m)  
Duration: 3 Hours | Max. Marks: 300

**SUBJECT: CHEMISTRY**

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1. The oxidation number of phosphorous in hypophosphoric acid is

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

Ans. (4)

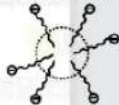
Sol. Hypophosphoric acid —  $H_2P_2O_6$   
 $4 \times 1 + 2 \times x + 6 \times (-2) = 0$   
 $\therefore x = +4$

2. Which of the following micelle structure is obtained when surfactant is added in polar solvent.



Ans. (1)

Sol. When surfactant added in polar solvent following micelles structure is obtained.

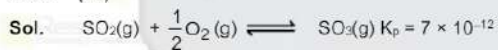


3. For reversible reaction at  $T = 27^\circ C$  &  $P = 1$  atm pressure



Then value of  $K_c$  is  $X \times 10^{-12}$ , then value of  $X$  is. (Nearest integer)

Ans. (35)



$$\Delta n = 1 - \frac{3}{2} = -\frac{1}{2}$$

$$K_p = K_c (RT)^{\Delta n}$$

$$7 \times 10^{-12} = K_c [0.082 \times 300]^{-\frac{1}{2}}$$

$$7 \times 10^{-12} = K_c [0.082 \times 300]^{\frac{1}{2}}$$

$$K_c = 7 \times 10^{-12} \times [0.082 \times 300]^{\frac{1}{2}}$$

$$= 7 \times 10^{-12} \times 4.96$$

$$= 34.72 \times 10^{-12} \approx 35 \times 10^{-12}$$

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4. The outer electronic configuration of  $Nd^{2+}$  is given as-

- (1)  $4f^4 6s^2$
- (2)  $4f^4 6s^0$
- (3)  $4f^2 6s^2$
- (4)  $4f^6 6s^0$

Ans. (2)

Sol.  $Nd(Z = 60) = 4f^4 6s^2$   
 $Nd^{2+} = 4f^4$

5. Identify correct increasing order of size of  $Ca^{2+}$ ,  $S^{2-}$ ,  $K^+$ ,  $Cl^-$  ions is

- (1)  $Ca^{2+} < K^+ < Cl^- < S^{2-}$
- (2)  $K^+ < Ca^{2+} < Cl^- < S^{2-}$
- (3)  $K^+ < Ca^{2+} < S^{2-} < Cl^-$
- (4)  $S^{2-} < Cl^- < K^+ < Ca^{2+}$

Ans. (1)

Sol. The correct increasing order of size is  
 $Ca^{2+} < K^+ < Cl^- < S^{2-}$

6. The increasing order of basic strength of oxides of vanadium,  $V_2O_3$ ,  $V_2O_4$ ,  $V_2O_5$ .

- (1)  $V_2O_4 > V_2O_3 > V_2O_5$
- (2)  $V_2O_3 < V_2O_4 < V_2O_5$
- (3)  $V_2O_5 < V_2O_4 < V_2O_3$
- (4)  $V_2O_3 = V_2O_4 = V_2O_5$

Ans. (3)

Sol. Basic strength of oxides  $\propto \frac{1}{O.N.}$  of element

oxide	$V_2O_3$	$V_2O_4$	$V_2O_5$
O.N.	+3	+4	+5
Basic strength	$V_2O_3 > V_2O_4 > V_2O_5$		

7. The hybridization of  $\text{XeF}_4$ ,  $\text{SF}_4$ ,  $\text{NH}_4^+$  and  $\text{BF}_3$  are respectively given as

- (1)  $\text{sp}^3\text{d}^2$ ,  $\text{sp}^3\text{d}$ ,  $\text{sp}^3$ ,  $\text{sp}^2$   
 (2)  $\text{sp}$ ,  $\text{sp}^3\text{d}$ ,  $\text{sp}^3$ ,  $\text{sp}^2$   
 (3)  $\text{sp}^2$ ,  $\text{sp}^3$ ,  $\text{sp}^3$ ,  $\text{sp}^3\text{d}$   
 (4)  $\text{sp}^3$ ,  $\text{sp}^3$ ,  $\text{sp}^2$ ,  $\text{sp}^3$

Ans. (1)



Sol.

$\text{XeF}_4$        $\text{SF}_4$        $\text{NH}_4^+$        $\text{BF}_3$

Hybridisation = No. of L.P. + No. of  $\sigma$  — bond

For  $\text{XeF}_4$   
 Hybridisation =  $4 + 2 = 6$        $\text{sp}^3\text{d}^2$

For  $\text{SF}_4$   
 Hybridisation =  $4 + 1 = 5$        $\text{sp}^3\text{d}$

For  $\text{NH}_4^+$   
 Hybridisation =  $4 + 0 = 4$        $\text{sp}^3$

For  $\text{BF}_3$   
 Hybridisation =  $3 + 0 = 3$        $\text{sp}^2$

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8. 2.56 gm of a non-electrolyte solute is dissolved in one litre of a solution. It has osmotic pressure equal to 4 bar at 300 K temperature. The molar mass of the compound is : (nearest integer) (Given  $R = 0.083 \text{ bar} \cdot \text{L}^{-1} \text{ mol}^{-1} \text{ K}^{-1}$ )

Ans. (16)

Sol.  $\pi = CRT$

$$4 = \frac{2.56}{M} \times \frac{1}{1} \times 0.083 \times 300$$

$$M = \frac{2.56 \times 0.086 \times 300}{4}$$

$$= 15.936 \approx 16 \text{ gm/mol}$$

9. 0.492 gm of an organic compound on combustion with excess oxygen give 0.792 gm of  $\text{CO}_2$  then find the percentage of carbon in the given organic compound.

Ans. (44)

Sol. 44 gm of  $\text{CO}_2$  contains 12 g carbon

0.792 gm of  $\text{CO}_2$  contains  $\frac{0.792 \times 12}{44}$  g of carbon

$$\% \text{ of carbon} = \frac{0.216}{0.492} \times 100$$

$$= 43.9\% \approx 44\%$$

10. In which of the following reactions  $\text{H}_2\text{O}_2$  acts as a reducing agent.

- (1)  $\text{H}_2\text{O}_2 + \text{Mn}^{2+} \longrightarrow \text{Mn}^{+4} + 2\text{OH}^-$   
 (2)  $\text{HOCl} + \text{H}_2\text{O}_2 \longrightarrow \text{H}_3\text{O}^+ + \text{Cl}^- + \text{O}_2$   
 (3)  $2\text{Fe}^{2+} + \text{H}_2\text{O}_2 + 2\text{H}^+ \longrightarrow 2\text{Fe}^{3+} + 2\text{H}_2\text{O}$   
 (4)  $\text{PbS} + 4\text{H}_2\text{O}_2 \longrightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$

Ans. (2)

Sol.  $\text{H}_2\text{O}_2$  acts an reducing agent in the following reaction.



11. The molar volume of  $\text{H}_2$  gas at STP conditions is 22.7 Lt. When 11.5gm of Zn reacts with excess conc. HCl, the volume of  $\text{H}_2$  gas formed (in it) is : (Atomic mass of Zn = 65.3 u)

Ans. (4)

Sol.  $\text{Zn} + 2\text{HCl} \longrightarrow \text{ZnCl}_2 + \text{H}_2$

$$\text{No. of moles of Zn} = \frac{11.5}{65.3} = \text{No. of moles of H}_2$$

$$\text{No. of H}_2 \text{ liberated} = 0.176 \times 22.7 \text{ Lt.}$$

$$= 3.99 \text{ L} \approx 4 \text{ Lt.}$$

12. Which of the following processes are not used for concentration of ore ?

- (A) Froth floatation      (B) Leaching  
 (C) Liquefaction      (D) Electrolysis      (E) Hydraulic washing





- (C) Leaching (1) A & E only (2) B & E only (3) C and D only (4) A & B only  
 (D) Electrolysis  
 (E) Hydraulic washing
- Ans.** (3)  
**Sol.** Concentration processes  
 (i) Hydraulic washing (ii) Magnetic separation  
 (iii) Froth floatation method (iv) Leaching

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13. Following values of K (rate constants) are given at different temperatures. Find out Ea(activation energy).

(1) 2.527 kJ (2) 11.488 kJ (3) 1.106 kJ (4) 51.437 kJ

**Ans.** (1)

**Sol.**  $\ln\left(\frac{K_2}{K_1}\right) = \frac{E_a}{R} \left[ \frac{1}{T_1} - \frac{1}{T_2} \right]$

$$\log\left(\frac{0.05}{0.03}\right) = \frac{E_a}{2.303 \times 8.314} \left[ \frac{1}{200} - \frac{1}{300} \right]$$

$$[0.70 - 0.48] = \frac{E_a}{2.303 \times 8.314} \left[ \frac{300 - 200}{300 \times 200} \right]$$

$$0.22 = \frac{E_a}{2.303 \times 8.314} \left[ \frac{1}{600} \right]$$

$$E_a = 0.22 \times 2.303 \times 8.314 \times 600$$

$$= 2527 \text{ J/m}$$

$$= 2.527 \text{ kJ}$$

14. What transition in the hydrogen spectrum would have the same wavelength as the transition from  $n = 4$  to  $n = 2$  in  $\text{He}^+$  ion spectrum ?

(1)  $n_2 = 2$  to  $n_1 = 1$  (2)  $n_2 = 3$  to  $n_1 = 1$  (3)  $n_2 = 4$  to  $n_1 = 3$  (4)  $n_2 = 5$  to  $n_1 = 2$

**Ans.** (1)

**Sol.**  $\lambda_H = \lambda_{\text{He}^+}$

$$R_H \times (1)^2 \left( \frac{1}{n_1^2} - \frac{1}{n_2^2} \right) = R_H \times (2)^2 \left( \frac{1}{(2)^2} - \frac{1}{(4)^2} \right)$$

$$\left( \frac{1}{n_1^2} - \frac{1}{n_2^2} \right) = \left( \frac{4}{4} \right) - \left( \frac{4}{16} \right)$$

$$\frac{1}{n_1^2} - \frac{1}{n_2^2} = 1 - \frac{1}{4}$$

$$n_1 = 1; n_2 = 2 \text{ for H-atom}$$

15. Lead storage battery have 38% (w/w)  $\text{H}_2\text{SO}_4$ . Find the temp at which the liquid of battery will freeze.

( $i = 2.67$ ) ; Kg of water =  $1.86 \text{ k} \cdot \frac{\text{K}}{\text{Mol}}$

(1)  $-3.1^\circ\text{C}$  (2)  $-31^\circ\text{C}$  (3)  $-0.31^\circ\text{C}$  (4)  $-0.031^\circ\text{C}$

**Ans.** (2)

**Sol.**  $\Delta T_f = i \times K_f \times \text{molality}$

Consider 100 g solution

$W(\text{H}_2\text{SO}_4) = 38 \text{ gm}$

$W(\text{Water}) = 62 \text{ g}$

$$\text{Molality} = \frac{38 \times 1000}{98 \times 62} = 6.254$$

$$\Delta T_f = i \times K_f \times \text{molality}$$

$$= 2.67 \times 1.86 \times 6.254 = 31$$





Freezing point of liquid in battery is  $-31^\circ\text{C}$

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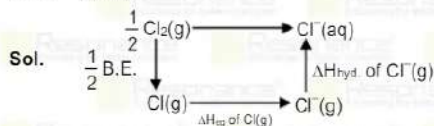
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16. The bond enthalpy of Cl-Cl = 240 kJ/mole, Electron gain enthalpy of Cl(g) = -350 kJ/mole and Hydration enthalpy of Cl<sup>-</sup>(g) = -360 kJ/mole. Calculate  $\Delta H_r^0$  for  $\frac{1}{2} \text{Cl}_2(\text{g}) \longrightarrow \text{Cl}^-(\text{aq})$

Ans. (-590)



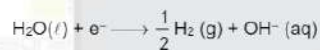
$$\Delta H_r^0 = \frac{1}{2} \times \text{B.E.} + \Delta H_{\text{eg}} + \Delta H_{\text{hyd}}$$

$$\Delta H_r^0 = \frac{1}{2} \times 240 + (-350) + (-360) = -590 \text{ kJ/mole}$$

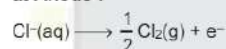
17. Choose the correct information regarding the products obtained on electrolysis of brine solution.  
(1) Cl<sub>2</sub> at cathode (2) O<sub>2</sub> at cathode (3) H<sub>2</sub> at cathode (4) OH<sup>-</sup> at anode

Ans. (3)

Sol. Brine solution - NaCl(aq)  
at Cathode :



at Anode :



18. The total pressure of mixture of 0.6g gas X (MW = 20g) and 0.45 g gas Y (MW = 45 g) is 740 mm of Hg. The partial pressure of gas X is :

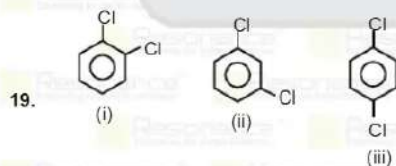
Ans. (555)

Sol. Number of moles of gas X =  $\frac{0.6}{20} = 0.03$

Number of moles of gas Y =  $\frac{0.45}{45} = 0.01$

Total number of moles = 0.03 + 0.01 = 0.04 mole

Partial pressure of gas X = Mole fraction × Total pressure  
=  $\frac{0.03}{0.04} \times 740 = 555$



Boiling point order of the given compound is :

(1) (i) > (ii) > (iii)                      (2) (ii) > (iii) > (i)

(3) (iii) > (ii) > (i)                      (4) (i) > (iii) > (ii)





Ans. (1)

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Sol. Boiling point of o, m, p dichlorobenzene depends primarily on polarity or dipole moment, hence the bp. of o, m, p dichlorobenzene is in the order o > m > p.

20. Which of the given has maximum sweetness level ?

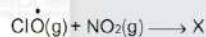
- (1) Alitame                      (2) Sucralose                      (3) Aspartame                      (4) Saccharine

Ans. (1)

Sol.

Sweetener	Sweetness value
Cane sugar	1
Aspartame	100
Saccharin	550
Sucralose	600
Alltame	2000

21. In the stratosphere, the reactions are :



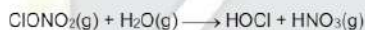
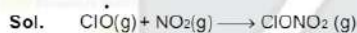
(1) HOCl, HNO<sub>3</sub>, ClONO<sub>2</sub>

(2) ClONO<sub>2</sub>, HOCl, HNO<sub>3</sub>

(3) ClONO<sub>2</sub>, HNO<sub>3</sub>, HOCl

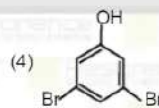
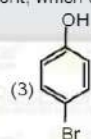
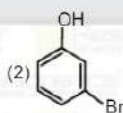
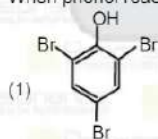
(4) HNO<sub>3</sub>, ClONO<sub>2</sub>, HOCl

Ans. (2)



from NCERT

22. When phenol reacts with Br<sub>2</sub> in low polarity solvent, which of the following will be the major product.



Ans. (3)

Sol. Phenol in low polarity solvent undergoes bromination yielding o and p bromophenol, whereas in high polarity solvent (water), undergoes bromination to give 2, 4, 6-tribromophenol.

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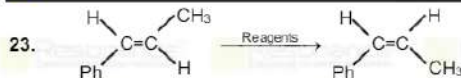
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What is reagent

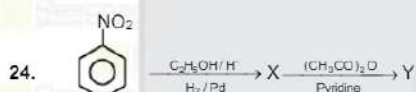
(1) Br<sub>2</sub>, alc. KOH, lindlar catalyst

(2) alc. KOH, Br<sub>2</sub>, lindlar catalyst

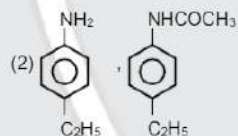
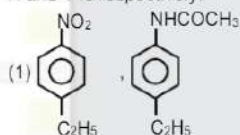
(3) lindlar catalyst, alc. KOH, Br<sub>2</sub>

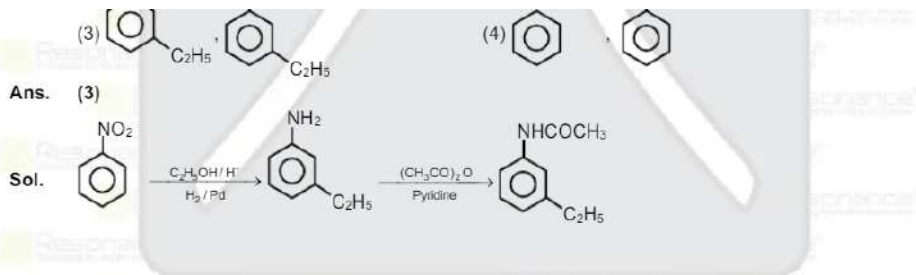
(4) Br<sub>2</sub>, lindlar catalyst, alc. KOH

Ans. (1)



X and Y is respectively.





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

# SPARK

15 WEEKS COMPAC COURSE

OFFLINE / ONLINE

CLASS  
STARTS

6<sup>th</sup> 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
- Back up support of recorded lectures
- Self Study Reports for Boys & Girls
- Guest Classes
- Post / Full Syllabus Test Series

### Facilities for Offline Students

- Self Study Reports for Boys & Girls



## TARGET: JEE (Main) 2023

Boost your Percentile with

# PERCENTILE BOOSTER COURSE

CLASS  
STARTS



8 WEEKS COMPAC COURSE

6<sup>th</sup> FEBRUARY 2023

OFFLINE / ONLINE

COURSE FEATURES

- Complete Course Coverage
- 25 Chapter wise Test
- Regular Practice through 3.5 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



**AIR 6**  
KARTHIKEYA POLISETTY  
Roll No.: 21925115

**AIR-1 GEN-EWS**

**AIR 8**  
DHEERAJ KURUKUNDA  
Roll No.: 21920114

Students in TOP-100 All India Ranks (AIRs)



**AIR-11**  
DEEVANSHU WALIA  
Roll No.: 21910344



**AIR-15**  
ABHJEET ANAND  
Roll No.: 21925115



**AIR-35**  
SANKAR SHRIVYA  
Roll No.: 21925115



**AIR-50**  
ANSHUL GARG  
Roll No.: 21920722



**AIR-54**  
SAKSHITA D. NAVIK  
Roll No.: 21920954



**AIR-58**  
KARISH SHARMA  
Roll No.: 21920484

ADMISSIONS OPEN FOR ACADEMIC SESSION 2023-24

TARGET: JEE (Adv.) 2024

for Class XII Passed Student

**VISHESH COURSE**

MODE: OFFLINE / ONLINE

CLASS STARTS 10<sup>th</sup> & 17<sup>th</sup> April

TARGET: JEE (Main) 2024

for Class XII Passed Student

**ABHYAAS COURSE**

MODE: OFFLINE / ONLINE

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

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

Resonance Eduventures | Limited

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