

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

# QUESTIONS & SOLUTIONS

Reproduced from Memory Retention

📅 18 March, 2021

SHIFT-2

🕒 03:00 pm to 06:00 pm



Duration : 3 Hours

Max. Marks : 300

## SUBJECT - CHEMISTRY

### JEE MAIN - (JANUARY) 2021 RESULT

**VPA Students Repeats the Dominance of Vidyapeeth Academy**

**Students with 99 percentile +**



**99.91 NTA Score**  
**ROUNIK ROUSHAN**

4 Years Classroom Program (till 10<sup>th</sup>)  
Completed IIT Syllabus in his  
Class 10<sup>th</sup> at Vidyapeeth Academy.



**99.41 NTA Score**  
**AADITYA GUPTA**

2 Years Classroom Program



**99.18 NTA Score**  
**DIVYA RAJ**

1 Year Classroom Program



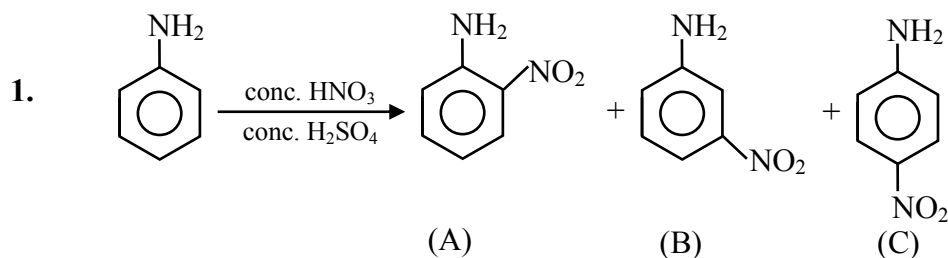
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**CHEMISTRY**



Select the correct order of percentage yield of products A, B & C respectively -

- (1)  $A > B > C$       (2)  $B > A > C$       (3)  $A > C > B$       (4)  $C > B > A$

Ans. (4)

2. Statement-1: Thermal power plant waste is non biodegradable.

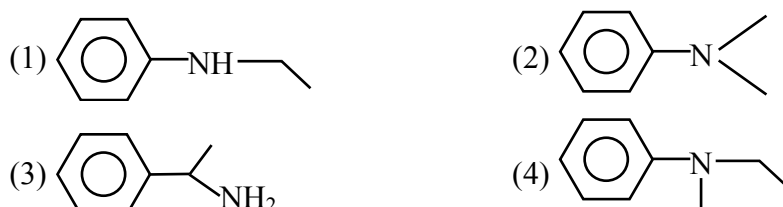
Statement-2: Biodegradable detergent causes eutrophication.

- (1) Both Statement-1 and Statement-2 are correct  
 (2) Both Statement-1 and Statement-2 are false  
 (3) Statement-1 is correct and Statement-2 is false  
 (4) Statement-1 is false and Statement-2 is correct

Ans. (1)

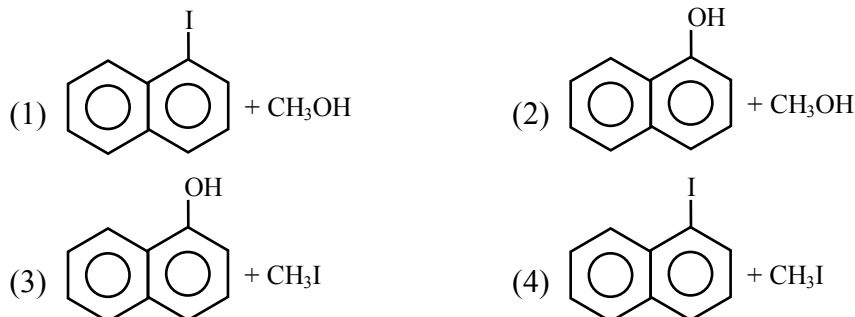
3. Compound A reacts with benzene sulfonyl chloride to form B which is soluble in NaOH.

Compound A is-

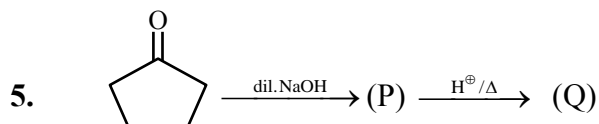


Ans. (3)

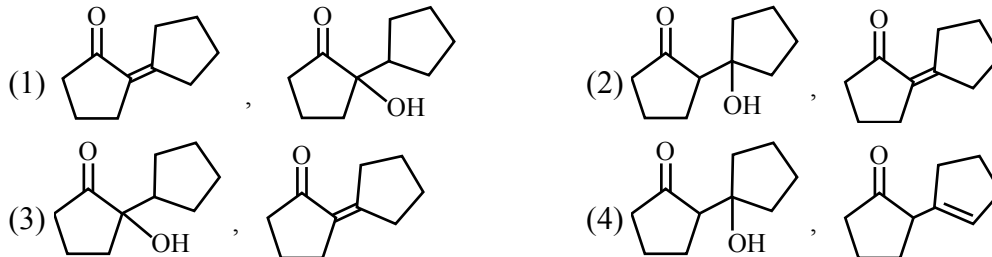
4. What product are obtained when 1-Methoxy naphthalene reacts with hydroiodic acid?



Ans. (3)



(P) and (Q) respectively are :



Ans. (2)

6. Match the column

**Column-I**

- (A) Artificial sugar  
(B) Tranquilizer  
(C) Antifertility drug  
(D) Antacid

**Column-II**

- (i) Meprobamate  
(ii) Ranitidine  
(iii) Norethindrone  
(iv) Alitame

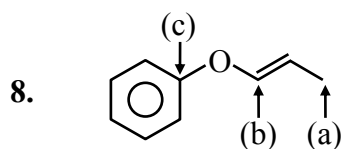
- (1) (A) → (iv) ; (B) → (i) ; (C) → (iii) ; (D) → (ii)  
(2) (A) → (iv) ; (B) → (i) ; (C) → (ii) ; (D) → (iii)  
(3) (A) → (iv) ; (B) → (iii) ; (C) → (i) ; (D) → (ii)  
(4) (A) → (i) ; (B) → (iii) ; (C) → (iv) ; (D) → (ii)

Ans. (1)

7. Vitamin K deficiency causes -

- (1) increased blood clotting time.                      (2) decreased blood clotting time.  
(3) increased fragility of RBCs.                        (4) night blindness.

Ans. (1)

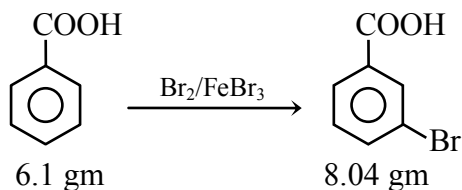


Hybridisation of marked carbon atoms a, b and c are respectively-

- (1)  $sp^3, sp^3, sp^3$             (2)  $sp^2, sp^2, sp^3$             (3)  $sp^3, sp^2, sp^2$             (4)  $sp^3, sp^2, sp$

Ans. (3)

9. Percentage yield of product obtained in the following reaction is



Ans. (80)

10. In the reaction of benzamide with hypobromite CO group is obtained in the form of -

- (1) CO                      (2) CO<sub>2</sub>                      (3) CO<sub>3</sub><sup>-2</sup>                      (4) HCO<sub>3</sub><sup>-</sup>

Ans. (3)

11. Match the column

**Column-I**

- (A) Be  
(B) Mg  
(C) Ca  
(D) Ra

**Column-II**

- (P) Used in treatment of cancer  
(Q) Used in reduction of metals  
(R) Used for making windows of x-ray tubes  
(S) Used in signal & explosive

- (1) (A) →(R) ; (B) →(S) ; (C) →(Q) ; (D) →(P)  
 (2) (A) →(P) ; (Q) →(S) ; (C) →(Q) ; (D) →(R)  
 (3) (A) →(P) ; (B) →(Q) ; (C) →(R) ; (D) →(S)  
 (4) (A) →(R) ; (B) →(Q) ; (C) →(S) ; (D) →(P)

Ans. (1)

12. H<sub>2</sub>O<sub>2</sub> in basic medium shows which of the following reaction

- (A) Mn<sup>2+</sup> → Mn<sup>4+</sup>  
 (B) I<sub>2</sub> → I<sup>-</sup>  
 (C) PbS → PbSO<sub>4</sub>

- (1) A & B                      (2) A only                      (3) B & C                      (4) B only

Ans. (1)

Sol. ⇒ PbS(s) + H<sub>2</sub>O<sub>2</sub> → PbSO<sub>4</sub> (s) + H<sub>2</sub>O

This reaction occurs in acidic medium  
 ⇒ all other occur in basic medium.

13. An ideal gas is taken in a container which is divided into 2 parts by a partition. Entropy of the parts is S<sub>1</sub> & S<sub>2</sub>. What will be the entropy if partition is removed?

- (1) S<sub>1</sub> + S<sub>2</sub>                      (2) S<sub>1</sub> × S<sub>2</sub>                      (3)  $\frac{S_1}{S_2}$                       (4)  $\frac{S_2}{S_1}$

Ans. (1)

Sol. Entropy is an extensive property

14.  $2A \longrightarrow A_2$   
 $T = 400 \text{ K}$ ,  
 $K_{\text{eq}} = x \times 10^{-4}$ ,  
 $\Delta G^\circ = 25.2 \text{ kJ/mol}$ ,  
 $R = 8.3 \text{ J/k-mol}$   
 Determine x?

Ans. (5)

Sol.  $\Delta G^\circ = -RT \ln k$

$$25.2 \times 10^3 = -2.3 \times 8.3 \times 400 \log_{10} K_{\text{eq}}$$

$$\log_{10} K_{\text{eq}} = -3.3$$

$$\therefore K_{\text{eq}} = 5 \times 10^{-4}$$

15. In a first order reaction,  $t_{1/2} = 1 \text{ min}$ . Time taken for 99.9% completion is ..... min.

$$(\ln 2 = 0.69, \ln 10 = 2.3)$$

Ans. (10)

Sol.  $k = \frac{1}{t} \ln \left( \frac{C_0}{C_t} \right)$

$$\frac{\ln 2}{1} = \frac{1}{t} \ln \left( \frac{100}{0.1} \right) \therefore t = \frac{\ln 1000}{\ln 2} = \frac{3 \times 2.3}{0.69} = 10$$

16. Match the column

**Column-A**

**Metals**

(A) Ni

(B) Si

(C) Cu

(D)

(1) A — p ; B— r ; C—q ; D—

(2) A — p ; B— q ; C—r ; D—

(3) A — r ; B— p ; C—q ; D—

(4) A — ; B— r ; C—q ; D—p

**Column-B**

**Refining process**

(p) Vapour phase refining

(q) Electrolytic refining

(r) Zone refining

Ans. (1)

17. **Statement-1** : Bohr's model helps in explaining spectral lines and stability of  $\text{Li}^+$   
**Statement-2** : Bohr's model fails to explain splitting of spectral lines in magnetic field.

(1) Both Statement-1 and Statement-2 are correct

(2) Both Statement-1 and Statement-2 are false

(3) Statement-1 is correct and Statement-2 is false

(4) Statement-1 is false and Statement-2 is correct

Ans. (4)

18. CdS & TiO<sub>2</sub> have \_\_\_\_\_ & \_\_\_\_\_ charged colloidal particles.

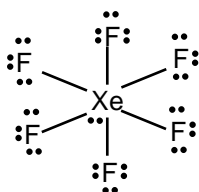
- (1) -, +                      (2) +, +                      (3) -, -                      (4) +, -

Ans. (1)

19. Upon partial hydrolysis of A, XeO<sub>2</sub>F<sub>2</sub> gets formed. Number of lone pairs in A = ?

Ans. (19)

Sol. XeF<sub>6</sub>  $\xrightarrow{\text{Partial hydrolysis}}$  XeO<sub>2</sub>F<sub>2</sub> + HF



No. of lone pair = 3 × 6 + 1 = 19

20. CuSO<sub>4</sub>.5H<sub>2</sub>O has x secondary valency of Cu<sup>2+</sup> & y H<sub>2</sub>O molecules bonded through H-bonding. x & y are respectively :

- (1) 4, 1                      (2) 6, 4                      (3) 6, 1                      (4) 1, 4

Ans. (1)

21. Boiling point of 2 molal aqueous solution of a non volatile solute is 100.52°C. Determine percentage of dimerisation of solute in solution. (Given K<sub>b</sub> = 0.52 K kg mol<sup>-1</sup> of H<sub>2</sub>O)

Ans. (100)

Sol.  $\Delta T_b = K_b \times i \times m$

$$0.52 = 0.52 \times i \times 2$$

$$i = \frac{1}{2}$$

$$\text{for dimerisation } i = 1 + \left(\frac{1}{2} - 1\right) \alpha = \frac{1}{2}$$

$$\alpha = 1 \text{ (100 \%)}$$

22. Arrange the following species in decreasing order of oxidation number of nitrogen.

NO, N<sub>2</sub>O, NO<sub>3</sub><sup>-</sup>, NO<sub>2</sub>

- (1) NO<sub>3</sub><sup>-</sup> > NO<sub>2</sub> > NO > N<sub>2</sub>O                      (2) NO<sub>2</sub> > NO<sub>3</sub><sup>-</sup> > NO > N<sub>2</sub>O  
 (3) N<sub>2</sub>O > NO > NO<sub>2</sub> > NO<sub>3</sub><sup>-</sup>                      (4) NO<sub>3</sub><sup>-</sup> > NO<sub>2</sub> > N<sub>2</sub>O > NO

Ans. (1)

Sol. NO<sub>3</sub><sup>-</sup>

$$x + 3(-2) = -1$$

$$x = +5$$

NO<sub>2</sub>

$$x + 2(-2) = 0$$

$$x = 4$$

NO

$$x + 1(-2) = 0$$

$$x = 2$$

$N_2O$

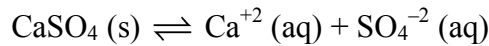
$$2x + 1(-2) = 0$$

$$x = 1$$

23. Solubility of  $CaSO_4$  in pure water is  $8 \times 10^{-4}$  M. If solubility of  $CaSO_4$  in 0.01 M  $H_2SO_4$  is  $x \times 10^{-6}$  M, determine x.

Ans. (64)

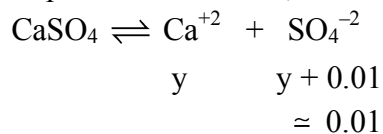
Sol. In pure  $H_2O$



$$K_{sp} = x^2 \quad (x: \text{solubility in pure } H_2O)$$

$$K_{sp} = 64 \times 10^{-8} = 6.4 \times 10^{-7}$$

In presence of  $H_2SO_4$ , Let solubility = y mol/L



$$\Rightarrow k_{sp} = [Ca^{+2}] [SO_4^{-2}]$$

$$\Rightarrow 6.4 \times 10^{-7} = y (10^{-2})$$

$$\Rightarrow y = 6.4 \times 10^{-5} = 64 \times 10^{-6} = x \times 10^{-6}$$

$$x = 64$$

24. If  $O_2$  behaves as ideal gas, find ratio of root mean square velocity & average velocity.

(1)  $\sqrt{\frac{3\pi}{8}}$       (2)  $\sqrt{\frac{3}{3}}$       (3)  $\sqrt{\frac{8\pi}{3}}$       (4)  $\sqrt{\frac{3\pi}{2}}$

Ans. (1)

Sol.  $v_{rms} = \sqrt{\frac{3RT}{M_o}}$

$$v_{avg} = \sqrt{\frac{8RT}{\pi M_o}}$$

$$\frac{v_{rms}}{v_{avg}} = \sqrt{\frac{3\pi}{8}}$$

25. The molar conductivity of  $\text{BaSO}_4$  at infinite dilution is :-

Given:  $\lambda_m^\circ (\text{BaCl}_2) = 278 \Omega^{-1} \text{mol}^{-1} \text{cm}^2$

$$\lambda_m^\circ (\text{H}_2\text{SO}_4) = 860 \Omega^{-1} \text{mol}^{-1} \text{cm}^2$$

$$\lambda_m^\circ (\text{HCl}) = 426 \Omega^{-1} \text{mol}^{-1} \text{cm}^2$$

**Ans. (286)**

**Sol.**  $\lambda_m^\circ (\text{BaCl}_2) = \lambda_m^\circ (\text{Ba}^{+2}) + \lambda_m^\circ (\text{SO}_4^{-2})$

$$= \lambda_m^\circ (\text{BaCl}_2) + \lambda_m^\circ (\text{H}_2\text{SO}_4) - 2\lambda_m^\circ (\text{HCl})$$
$$= 278 + 860 - 2 \times 426$$
$$= 286 \Omega^{-1} \text{mol}^{-1} \text{cm}^2$$