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JEE

(Main)

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

2022

COMPUTER BASED TEST (CBT)

Memory Based Questions & Solutions

Date: 25 June, 2022 (SHIFT-1) | TIME : (9.00 a.m. to 12.00 p.m)

Duration: 3 Hours | Max. Marks: 300

SUBJECT: CHEMISTRY

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PART : CHEMISTRY

1. Identify group of ion which are isoelectronic with Al^{3+} ion :

- (1) Mg^{2+} , O^{2-} (2) Na^+ , N^{2-} (3) C^{+} , Cl^{-} (4) F^{-} , Mg^{+}

Ans. (1)

Sol. Species Al^{3+} Mg^{2+} O^{2-} Na^+ N^{2-} C^{+} Cl^{-} F^{-} Mg^{+}

No. of e⁻ 10 10 10 10 9 10 18 10 11

So Mg²⁺ & O²⁻ are isoelectronic with Al³⁺

2. Removing an electron from how many of the following species bond strength increases.

- (a) B₂ (b) NO (c) N₂ (d) O₂ (e) C₂
 (1) b, d (2) a, b, d (3) b, e (4) b, c

Ans. (1)

Species	B ₂	NO	N ₂	O ₂	C ₂
Bond order	1	2.5	3	2	2
Species	B ₂ ⁺	NO ⁺	N ₂ ⁺	O ₂ ⁺	C ₂ ⁺
Bond order	0.5	3	2.5	2.5	1.5

3. Ionic mobility of which of the following 2nd group metal ions is maximum in aqueous solution?

- (1) Mg²⁺ (2) Ca²⁺ (3) Sr²⁺ (4) Be²⁺

Ans. (3)

Sol. Smaller the size of ion greater is its hydration & greater is its hydrated radii & smaller is ionic mobility.

So order of ionic mobility : Be²⁺ < Mg²⁺ < Ca²⁺ < Sr²⁺ < Ba²⁺

4. S₁ : Davison of Germer experiment explains the wave nature of electron.

S₂ : Electron in its wave nature when undergoes interference shows diffraction pattern.

- (1) Both S₁ & S₂ are true (2) Both S₁ & S₂ are false
 (3) S₁ is true & S₂ is false (4) S₁ is false & S₂ is true

Ans. (1)

5. Density of NaCl solid is 43.1 g/cm³ and distance between Na⁺ & Cl⁻ ions is [X] × 10⁻¹⁰ m, then value of X is : [Given : N_A = 6 × 10²³] (Report your answer to nearest integer).

Ans. (1)

Sol. For NaCl Z = 4 & M = 58.5 gram

$$d = \frac{Z \times M}{N_A \times \text{Volume}}$$

$$43.1 = \frac{4 \times 58.5}{6 \times 10^{23} \times [a]^3}$$

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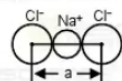
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$$a^3 = \frac{4 \times 58.5}{6 \times 43.1} \times 10^{-23}$$

$$= 0.9 \times 10^{-23}$$

$$= 9 \times 10^{-24}$$

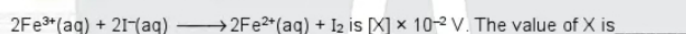
$$a = 2.08 \times 10^{-8} \text{ cm}$$



$$d_{Na^+ + Cl^-} = \frac{a}{2} = \frac{2.08 \times 10^{-10}}{2} \text{ m}$$

Ans. 1

6. The E^o_{cell} for the following reaction.



$$\text{Given } E^o_{Fe^{3+}/Fe^{2+}} = 0.77V \text{ \& } E^o_{I_2/I^-} = 0.54V$$

Ans. (23)

$$\begin{aligned} \text{Sol. } E^o_{\text{cell}} &= (E^o_{\text{RP}})_C - (E^o_{\text{RP}})_A \\ &= 0.77 - 0.54 \\ &= 0.23V \end{aligned}$$

$$= 23 \times 10^{-2} \text{ V}$$

Ans. 23

7. Strongest oxidising agent among the following is :

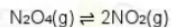
- (1) Ti^{3+} (2) Cr^{3+} (3) Fe^{3+} (4) Mn^{2+}

Ans. (3)

Sol. Oxidising agent gets reduced.

Most stable oxidation state of $\text{Ti} \rightarrow +4$; $\text{Cr} \rightarrow +3$; $\text{Fe} \rightarrow +2$; $\text{Mn} \rightarrow +2$ (acidic medium), 4(basic medium)

8. $\text{N}_2\text{O}_4(\text{g})$ dissociates to NO_2 according to following reaction.



ΔG° of reaction at 298 K & 1 atm pressure when 50% of N_2O_4 is dissociates at equilibrium is :

- (1) -684.7 J (2) 684.7 J (3) -342.35 J (4) 342.35 J

Ans. (1)

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Sol. $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$

$$1-\alpha \quad 2\alpha$$

$$K_p = \frac{4\alpha^2 p}{1-\alpha^2} = \frac{4 \times (0.5)^2 \times 1}{1-(0.5)^2} = \frac{1}{0.75}$$

$$K_p = \frac{4}{3}$$

$$\Delta G^\circ = -2.303 RT \log K_p$$

$$= -2.303 \times 8.314 \times 298 \left[\log \frac{4}{3} \right]$$

$$= -684.7 \text{ J}$$

9. White ppt of AgCl dissolves in NH_4OH due to formation of :

- (1) AgOH (2) Ag_2O (3) $[\text{Ag}(\text{NH}_3)_2]\text{Cl}$ (4) $[\text{Ag}(\text{NH}_3)_4]\text{Cl}$

Ans. (3)

Sol. $\text{AgCl} \downarrow + 2\text{NH}_4\text{OH} \rightarrow [\text{Ag}(\text{NH}_3)_2]\text{Cl} + 2\text{H}_2\text{O}$

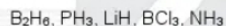
10. Less amount of soap does not do cleaning action properly due to :

- (1) CMC value is very high than required
(2) CMC value is very low than required
(3) Macromolecule colloid formation occurs
(4) It does not act as electrolyte

Ans. (2)

Sol. Micelle or associate colloid formation occurs above a certain conc. known as CMC.

11. How many of the following are electron deficient compounds ?



- (1) 0 (2) 1 (3) 2 (4) 3

Ans. (3)

Sol. $\text{B}_2\text{H}_6, \text{BCl}_3$

12. If 0.02 moles of H_2SO_4 are present in 1 lit. of solution from which 50% solutions taken out and again diluted upto 1 lit. by adding water and further 0.01 moles of H_2SO_4 are added than total millimole of H_2SO_4 in resulting solution is _____.

Ans. 20

Sol. Initial moles of H_2SO_4 (in/Lit.) = 0.02

In 50% solution moles of H_2SO_4 = 0.01

Added moles of H_2SO_4 = 0.01

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Total moles of H_2SO_4 in resulting solution = 0.02

= 20×10^{-3} moles

= 20 millimoles

Ans. 20

13. Given 645 of compound $\text{C}_6\text{H}_5\text{N}_3\text{O}_6$ determine no. of N atoms present in compound. Report x, if your answer is $x \times 10^{21}$ {C = 12, H = 1, N = 1, O = 16} ($N_A = 6.02 \times 10^{23}$)

Ans. (5418)

Sol. Moles of compound ($\text{C}_6\text{H}_5\text{N}_3\text{O}_6$) = $\frac{645}{215} = 3$ mol

moles of Nitrogen = 9 mole

No. of atoms of Nitrogen = $9 \times 6.02 \times 10^{23}$

= 54.18×10^{23}

= 5418×10^{21}

14. In extraction of gold, it is dissolved in NaCN in presence of oxygen then following complex is formed.

(1) $[\text{Au}(\text{CN})_2]^-$

(2) $[\text{Au}(\text{CN})_2]^{2-}$

(3) $[\text{Au}(\text{CN})_4]^{2-}$

(4) $[\text{Au}(\text{CN})_4]^{3-}$

Ans. (1)

Sol. $4\text{Au}(s) + 8\text{CN}^-(aq) + 2\text{H}_2\text{O}(aq) + \text{O}_2(g) \longrightarrow 4[\text{Au}(\text{CN})_2]^- (aq) + 4\text{OH}^- (aq)$

15. Ce^{4+} act as :

(1) strong oxidising agent

(2) strong reducing agent

(3) not show redox

(4) act as oxidising and reducing agent.

Ans. (1)

Sol. Formation of Ce^{IV} is favoured by its noble gas configuration but it is strong oxidant reverting to the +3 state. The E° value for $\text{Ce}^{4+}/\text{Ce}^{3+}$ is $E^\circ_{\text{Ce}^{4+}}/E^\circ_{\text{Ce}^{3+}} = 1.74 \text{ V}$ is favourable for its oxidising nature.

16. Which of the following information is incorrect regarding Tyndall effect.

(1) The diameter of dispersed particles is much smaller than the wavelength of light used

(2) In lyophobic colloids difference in refractive indice of DP & DM is appreciable therefore the Tyndall effect is quite well defined.

(3) Light thrown from a projector in cinema hall is example of Tyndall effect.

(4) It is used to differentiate colloidal solutions with true solution.

Ans. (1)

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Sol. According to NCERT text

*The diameter of the dispersed particles is not much smaller than the wavelength of the light used
 *The intensity of scattered light depends on the difference between the refractive indices of the D.P and D.M., In lyophobic colloids, this difference is appreciable and therefore the Tyndall effect is quite well defined but in lyophilic sols the difference is very small and the Tyndall effect is very weak.
 So, to show Tyndall effect the refractive indices of the dispersed phase and dispersion medium differ greatly in magnitude.

17. Which of the given is related with increase in eutrophication of pond water.

- (1) Increases in biodiversity
- (2) Decrease in biodiversity
- (3) Biological oxygen demand decreases
- (4) None of these

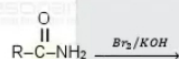
Ans. (2)

18. Which of the given is an artificial sugar.

- (1) Sucrose
- (2) Lactose
- (3) Allitame
- (4) Codeine

Ans. (3)

19. Correct intermediate in the given reaction is :



- (1) R-N=C=O
- (2) R-NHBr
- (3) R-NBr₂
- (4) R-CO-NBr₂

Ans. (1)

20. The correct IUPAC name of Ethylidenechloride is :

- (1) 1, 2-Dichloroethane
- (2) 1, 1-Dichloroethane
- (3) 1, 2-Dichloroethene
- (4) 1, 1-Dichloroethene

Ans. (2)

21. Phenol with nitric acid gives two different products A and B. Product A and B can be separated by:

- (1) Steam distillation
- (2) fractional distillation
- (3) chromatography
- (4) filtration

Ans. (2)

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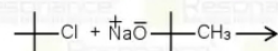
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22. Product of the given reaction is :

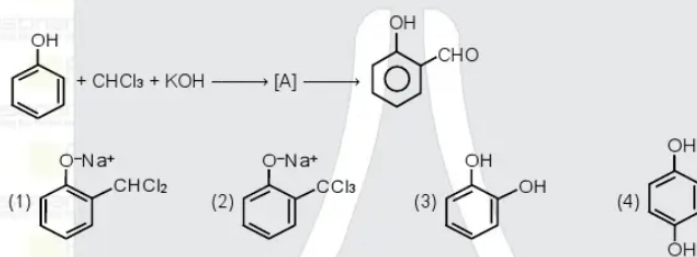


- (1) t-butylether
- (2) 2-methylpropene
- (3) 2-methylpent-1-ene
- (4) 2,2,3,3-tetramethylbutane

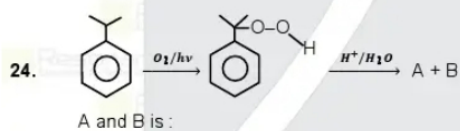
Ans. (2)

Sol. t-butoxide ion carryout Elimination reaction at 3° alkyl halide

23. In the given reaction, [A] is :



Ans. (1)



Ans. (1)

Sol. Cumene hydroperoxide undergoes rearrangement to give phenol and acetone.

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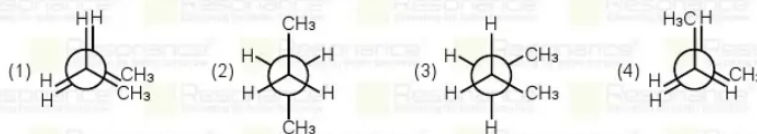
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25. Identify the staggered conformation with maximum dihedral angle :

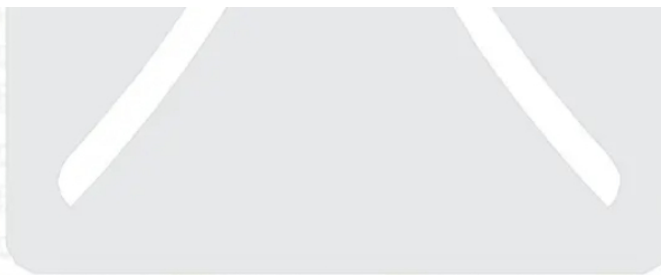


Ans. (2)

Sol. In anti conformation the dihedral angle is 180° (maximum)

26. 5 gram of pent-1-ene react with how much gram of Br₂ completely rounded off to nearest configuration.

Ans. 5.53



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