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JEE (Main)

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

2022

COMPUTER BASED TEST (CBT)

Memory Based Questions & Solutions

Date: 28 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. Which of the following statement is incorrect regarding defects in solid.
(1) In schottky defect density decreases
(2) In Frenkel defect density remain unchanged
(3) In interstitial defect density increases

(4) Due to electronic vacancy density of solid increases.

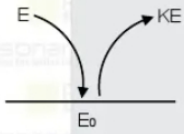
Ans. **(4)**

Sol. Theory based.

2. If work function of a metal is 6.63×10^{-19} J minimum wave length of photon which is just sufficient to eject electron from metal surface is ___ nm. (Given h = 6.63×10^{-34} J/sec)

Ans. **(300)**

Sol.



$E = E + KE$

for just ejection of electron

$$E = E_0 = \frac{hc}{\lambda} = 6.63 \times 10^{-34}$$

$$\Rightarrow \frac{6.63 \times 10^{-34} \times 3 \times 10^{8}}{\lambda} = 6.63 \times 10^{-19}$$

$\lambda = 3 \times 10^{-7}$ m

$= 300 \times 10^{-9}$ m

= 300 nm

3. What is the correct electronic configuration of an element which is just above 16th group 4th period element.

(1) $4s^2\ 3d^{10}\ 4p^4$ (2) $2s^2\ 2p^4$ (3) $3s^2\ 3p^4$ (4) $5s^2\ 5d^{10}\ 4p^4$

Ans. **(3)**

Sol.

	16th group	EC
2nd	$_8O$	$2s^2\ 2p^4$
3rd	$_{16}S$	$3s^2\ 3p^4$
4th	$_{34}Se$	$4s^2\ 4p^4$
5th	$_{52}Te$	$5s^2\ 5d^{10}\ 4p^4$

4. How many charge in Faraday's is required in conversion of 1 mole $Cr_2O_7^{2-}$ in to Cr^{3+}.

Ans. **(6)**

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

1 mole 6 mole

Charge = 6F

5. For 2 mole of an ideal mono atomic gas at 300 K calculate internal energy. (Given R = 8.31 J/mol × k)

Ans. **(7479)**

Sol. $U = \frac{F}{2}nRT$

$= \frac{3}{2} \times 2 \times 8.31 \times 300$

= 7479 J

6. An ideal gas expands isothermally from 4 lit. to 20 lit. against vaccum, then how much amount of heat is absorbed.

Ans. **(0)**

Sol. Work done against vaccum = 0

As process is isothermal so $\Delta U = 0$

$\Delta U = q + w$

so q = 0

7. For a first order reaction $t_{67\%} = \left(\frac{x}{10}\right)t_{50\%}$ & $k = 3.84 \times 10^{9}\ sec^{-1}$ then value of x is _____.
(Report your answer to nearest integer)

Ans. **(16)**

Sol. $t_{67\%} = \frac{1}{k}\ln\left(\frac{100}{33}\right)$

$t_{50\%} = \frac{1}{k}\ln(2)$

$\frac{t_{67\%}}{t_{50\%}} = \frac{\ln\left(\frac{100}{33}\right)}{\ln 2}$

$\Rightarrow \frac{t_{67\%}}{t_{50\%}} = \frac{\log\left(\frac{100}{33}\right)}{\log 2}$

$\Rightarrow \frac{\log 3}{\log 2} = \frac{0.4771}{0.3} = 1.585$

So x = 15.85

8. Dihydrogen react with CuO and form :
(1) Cu (2) $Cu(OH)_2$ (3) CuH_2 (4) Cu_2O

Ans. **(1)**

Sol. $CuO + H_2 \longrightarrow Cu + H_2O$

9. Vapour pressure of pure A is 50 mm of Hg and vapour pressure of pure B is 100 mm of Hg in mixture of liquid A and B mole fraction of A is 0.3, then mole fraction of B in vapour phase is $\left(\frac{X}{17}\right)$. The value of X is:

Ans. **(14)**

Sol. $P_{Total} = P^{o}_{A \times A} + P^{o}_{B \times B}$

$= (50)\ 0.3 + (100)\ 0.7$

$= 15 + 70$

$= 85$ mm of Hg.

$P_B = (P_{Total})\ Y_B$

$\Rightarrow 70 = (85)Y_B$

$\Rightarrow Y_B = \frac{78}{85} = \frac{14}{17} = 14$

10. Zeta potential is related to :
(1) Brownion movement (2) Tyndall effect
(3) Colour (4) Charge on colloid

Ans. **(4)**

Sol. This potential difference between the fixed layer and diffused layer of opposite charges is called electrokinetic potential or zeta potential.

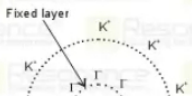
$Z = \frac{4\pi\eta\mu}{D}$

n = Viscosity coefficient

D = Dielectric constant of medium

μ = Velocity of colloidal particle when an electric field is applied.

e.g. $AgNO_3 + \underset{(excess)}{KI} \rightarrow AgI + KNO_3$



11. S_1 : E_2O_5 is less acidic than E_2O_3 (element E is belongs to 15th group).
S_2 : E_2O_3 acidic strength decreases down the group (element E is belongs to 15th group).
(1) Both S_1 & S_2 are true (2) Both S_1 & S_2 are false
(3) S_1 is true & S_2 is false (4) S_1 is false & S_2 is true

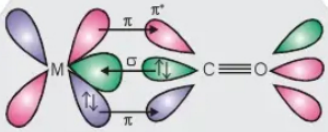
Ans. **(1)**

Sol. **S_1 :** In 15th group oxide higher the oxidation state of element higher is acidic character
Example : P_2O_3 less acidic than P_2O_5.
15th group
N_2O_3 Acidic
P_2O_3 Acidic
As_2O_3 Amphoteric
Sb_2O_3 Amphoteric
Bi_2O_3 Basic

12. In how many of the following synergic bonding is present :
(i) $[Mn(CO)_5]$ (ii) $[Mn_2(CO)_{10}]$ (iii) $[Cr(CO)_6]$

Ans. **(3)**

Sol. The M—Cπ bond is formed by the donation of a pair of electrons from a filled d orbital of metal into the vacant antibonding π^* orbital of carbon monoxide. Thus carbon monoxide acts as σ donor (OC $\rightarrow$ M) and a π acceptor (OC $\leftarrow$ M), with the two interactions creating a synergic effect which strengthens the bond between CO and the metal as shown in figure.



Synergic bonding

13. **Assertion :** Below 1350°C Mg reduces Al_2O_3 above 1350°C Al reduces MgO.
Reason : Mg melting point & boiling point is less than Al.
(1) Assertion and reason both are correct and reason is correct explanation of assertion.
(2) Assertion and reason both are correct statements but reason is not correct explanation of assertion.
(3) Assertion is correct but reason is wrong statement.
(4) Assertion is wrong but reason is correct statement.

Ans. **(2)**

Sol. Below 1350°C graph of ΔG° v/s T of MgO is lower than Al_2O_3 while above 1350°C graph of MgO is above than Al_2O_3 so assertion is true.

	Al	Mg
M.P.	933 K	924 K
B.P.	2740 K	1363 K

14. Which of the following f block element is most stable in divalent oxidation state ?

(1) Sm (2) Eu (3) Tb (4) Ce

Ans. **(2)**

Sol. $_{63}Eu = [Xe]4f^7\ 6s^2$ $_{62}Sm = [Xe]4f^6\ 6s^2$ $_{65}Tb = [Xe]4f^9\ 6s^2$ $_{58}Ce = [Xe]4f^1\ 5d^1\ 6s^2$

$_{63}Eu^{2+} = [Xe]4f^7$ $_{62}Sm^{2+} = [Xe]4f^6$ $_{65}Tb^{2+} = [Xe]4f^9$ $_{58}Ce^{2+} = [Xe]4f^1\ 5d^1$

15. Which of the following compound on thermal decomposition give nitrogen gas.

(1) $Ba(N_3)_2$ (2) $NaNO_2$ (3) $Ba(NO_3)_2$ (4) $NaNO_3$

Ans. **(1)**

Sol. $Ba(N_3)_2 \xrightarrow{\Delta} Ba + N_2$

$2NaNO_2 \xrightarrow{\Delta} Na_2O + NO + NO_2$

$NaNO_3 \xrightarrow{\Delta} NaNO_2 + O_2$

$Ba(NO_3)_2 \xrightarrow{\Delta} BaO + NO_2 + O_2$

16. **S_1 :** Hybridisation of $[Ni(CN)_4]^{2-}$ is dsp^2 with square planar geometry & diamagnetic character while hydrisation of $[Ni(CO)_4]$ is sp^3 with tetrahedral geometry and paramagnetic character.

S_2 : $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$ have same geometry and hybridisation and both are paramagnetic and have same d orbital configuration.

(1) Both S_1 & S_2 are true (2) Both S_1 & S_2 are false

(3) S_1 is true & S_2 is false (4) S_1 is false & S_2 is true

Ans. **(2)**

Sol. $[Ni(CN)_4]^{2-} \Rightarrow Ni^{2+} \Rightarrow 3d^8\ 4s^0 \Rightarrow dsp^2$ = Square planar $\Rightarrow$ diamagnetic

$[Ni(CO)_4] \Rightarrow Ni \Rightarrow 3d^8\ 4s^2 \Rightarrow 3d^{10} = sp^3 \Rightarrow$ Tetrahedral $\Rightarrow$ diamagnetic

$[NiCl_4]^{2-} \Rightarrow Ni^{2+} \Rightarrow 3d^8\ 4s^0 \Rightarrow sp^3 \Rightarrow$ Tetrahedral $\Rightarrow$ paramagnetic

17. Hybridisation of PF_5 is SP^xd^y, then value of Y is :

Ans. **(1)**

Sol. Hybridisation of PF_5 is $\Rightarrow sp^3d$.

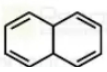
so y = 1

18. Which force is responsible for stability of helical structure in α-helix protein.

(1) Vander wall force (2) Hydrogen bonding (3) Pi interaction (4) Dipole interaction

Ans. (2)

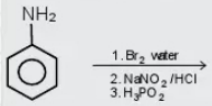
19. Which of the following is aromatic.

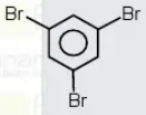
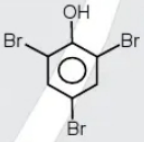
(A) (B)  (C) (D)

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

Ans. (2)

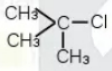
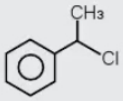
20. The product of given reaction is :



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

Ans. (1)

21. Which of the following does not gives SN^1 reaction

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

Ans. (2)

22. Which of the given is not a pesticide.

(1) D.D.T. (2) Organophosphate

(3) Sodium arsenate (4) Dialdrin

Ans. (3)

23. The violet coloured complex formed in Lassaigne test is :

(1) $Na_4[Fe(CN)_6NOS]$ (2) $Na_2[Fe(CN)_5NO]$ (3) $K_4[Fe(CN)_6]$ (4) $Fe_4[Fe(CN)_6]_3$

Ans. (1)

24. Which is not a copolymer.

(1) PHBV (2) Neoprene (3) Buna-S (4) Butadiene-styrene

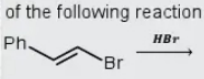
Ans. (2)

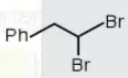
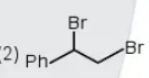
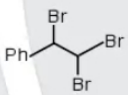
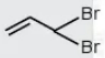
25. Reaction of 1° aliphatic amine with HNO_2 at 273 K initially gives a product, but if temperature is increased to 298, the product formed is :

(1) Nitrile (2) Alcohol (3) Diazonium salt (4) Secondary amine

Ans. (2)

26. Product of the following reaction is :



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

Ans. (2)

27. 0.5 gram of an organic compound gives 0.4 gram of dry AgBr ppt. % of Br in organic compound is [At. Wt. of Ag = 108, At. Wt. of Br = 80]

Ans. (34)

Sol. Wt. of AgBr = 0.4 g

Wt. of AgBr = $\frac{0.4}{188}$

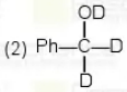
Wt. of Br = $\frac{0.4}{188} \times 80$ g

% of Br = $\frac{0.4}{188} \times \frac{80}{0.5} \times 100 = 34\%$

28. In the given reaction, A is :

$$Ph{-}CHO + Ph{-}CHO \xrightarrow[2.D_2O]{1.NaOD} A + Ph{-}C(=O){-}O^-$$

(1)

(2) 

(3)

(4)

Ans. (1)

29. In thin lager chromatography. Which of the following is not used to visualise the separated layer.

(1) Visualising agent in mobile phase (2) Spraying of suitable reagent

(3) uv light (4) I_2 solid

Ans. (1)

27th June & 4th July

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