

JEE Main 2020 Paper



Date : 2nd September 2020

Time : 2 : 00 pm - 5 : 00 pm

Subject : Chemistry

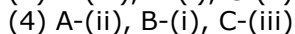
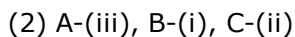
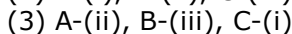
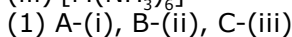
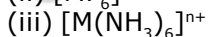
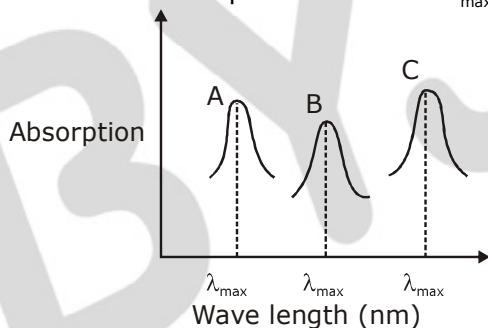
- 1.** Cast iron is used for the manufacture of :
 (1) Wrought iron and steel (2) Wrought iron and pig iron
 (3) Wrought iron, pig iron and steel (4) Pig iron, scrap iron and steel

Sol. 1
 Refer topic metallurgy

- 2.** The shape/structure of $[\text{XeF}_5]^-$ and XeO_3F_2 , respectively, are :
 (1) Pentagonal planar and trigonal bipyramidal
 (2) Trigonal bipyramidal and trigonal bipyramidal
 (3) Octahedral and square pyramidal
 (4) Trigonal bipyramidal and pentagonal planar

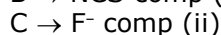
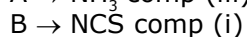
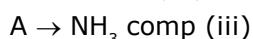
Sol. 1
 $[\text{XeF}_5]^-$ 5BP + 2LP = 7VSEP \Rightarrow sp^3d^3 hybridisation
 XeO_3F_2 5BP + 0LP = 5VSEP \Rightarrow sp^3d hybridisation

- 3.** Simplified absorption spectra of three complexes ((i), (ii) and (iii)) of M^{n+} ion are provided below; their λ_{max} values are marked as A, B and C respectively. The correct match between the complexes and their λ_{max} values is :



Sol. 2

$$\Delta = \frac{hc}{\lambda_{\text{absorbed}}(\text{max})}$$



using spectrochemical series of ligand

$\text{F}^- < \text{NCS}^- < \text{NH}_3$ order of $\Delta + e$

crystal field splitting energy

So. NH_3 complex \rightarrow A

F^- complex \rightarrow C

NCS^- complex \rightarrow B

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6. Match the type of interaction in column A with the distance dependence of their interaction energy in column B :

A		B	
(I) ion-ion	(a)	$\frac{1}{r}$	
(II) dipole-dipole	(b)	$\frac{1}{r^2}$	
(III) London dispersion	(c)	$\frac{1}{r^3}$	
	(d)	$\frac{1}{r^6}$	
(1) (I)-(a), (II)-(b), (III)-(d)			(2) (I)-(a), (II)-(b), (III)-(c)
(3) (I)-(b), (II)-(d), (III)-(c)			(4) (I)-(a), (II)-(c), (III)-(d)

Sol. 4

$$\text{ion - ion} \propto \frac{1}{r}$$

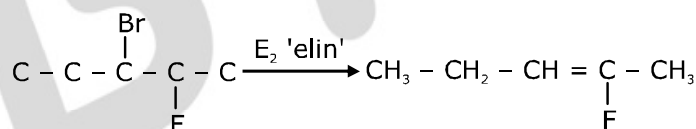
$$\text{dipole - dipole} \propto \frac{1}{r^3}$$

$$\text{London dispersion} \propto \frac{1}{r^6}$$

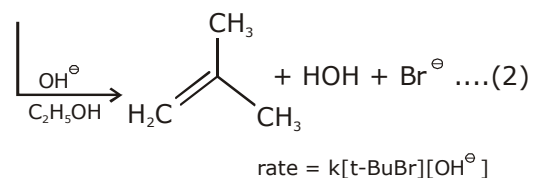
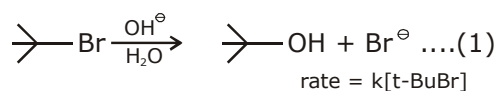
7. The major product obtained from E_2 - elimination of 3-bromo-2-fluoropentane is :



Sol. 1



8. Consider the reaction sequence given below :



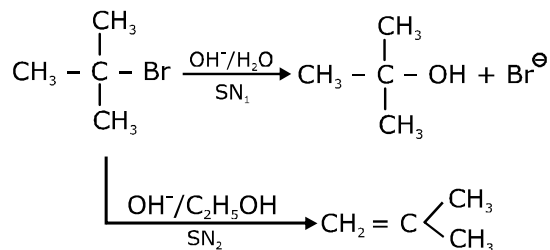
Which of the following statements is true :

- (1) Changing the concentration of base will have no effect on reaction (1).
- (2) Doubling the concentration of base will double the rate of both the reactions.
- (3) Changing the base from OH^\ominus to $^\ominus\text{OR}$ will have no effect on reaction (2).
- (4) Changing the concentration of base will have no effect on reaction (2).

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Sol. 1



9. The size of a raw mango shrinks to a much smaller size when kept in a concentrated salt solution. Which one of the following process can explain this ?

- (1) Diffusion (2) Osmosis
(3) Reverse osmosis (4) Dialysis

Sol. 2

Theoretical
Ans. Osmosis
Option (2)

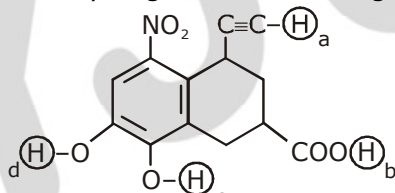
10. If you spill a chemical toilet cleaning liquid on your hand, your first aid would be :

- (1) Aqueous NH_3 (2) Aqueous NaHCO_3
(3) Aqueous NaOH (4) Vinegar

Sol. 2

Fact

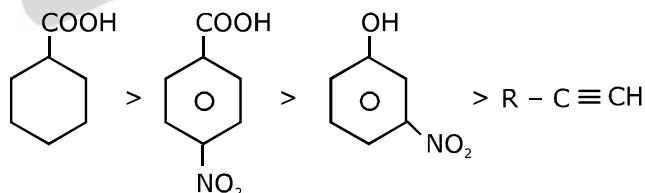
11. Arrange the following labelled hydrogens in decreasing order of acidity :



- (1) $b > a > c > d$ (2) $b > c > d > a$
(3) $c > b > d > a$ (4) $c > b > a > d$

Sol. 2

Order of acidic strength



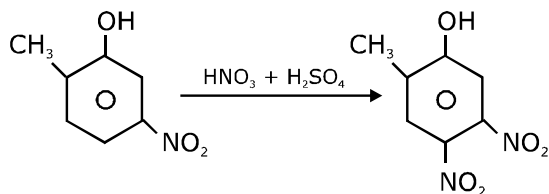
12. An organic compound 'A' ($\text{C}_9\text{H}_{10}\text{O}$) when treated with conc. HI undergoes cleavage to yield compounds 'B' and 'C'. 'B' gives yellow precipitate with AgNO_3 whereas 'C' tautomerizes to 'D'. 'D' gives positive iodoform test. 'A' could be :

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

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Sol. 3

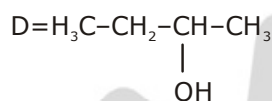


16. Two compounds A and B with same molecular formula (C_3H_6O) undergo Grignard's reaction with methylmagnesium bromide to give products C and D. Products C and D show following chemical tests.

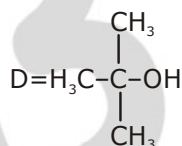
Test	C	D
Ceric ammonium nitrate Test	Positive	Positive
Lucas Test	Turbidity obtained after five minutes	Turbidity obtained immediately
Iodoform Test	Positive	Negative

C and D respectively are :

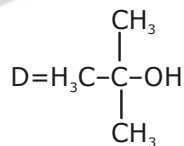
(1) $C = H_3C-CH_2-CH_2-CH_2-OH$;



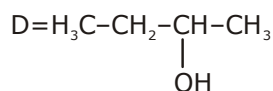
(2) $C = H_3C-CH_2-\underset{\substack{| \\ OH}}{CH}-CH_3$;



(3) $C = H_3C-CH_2-CH_2-CH_2-OH$;



(4) $C = H_3C-\underset{\substack{| \\ CH_3}}{\overset{\substack{CH_3 \\ |}}{C}}-OH$



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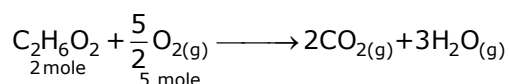
- 21.** The ratio of the mass percentages of 'C & H' and 'C & O' of a saturated acyclic organic compound 'X' are 4 : 1 and 3 : 4 respectively. Then, the moles of oxygen gas required for complete combustion of two moles of organic compound 'X' is _____.

Sol. Mass ratio of C : H is 4 : 1 \Rightarrow 12 : 3
& C : O is 3 : 4 \Rightarrow 12 : 16
So,

	mass	mole	molar ratio
C	12	1	1
H	3	3	3
O	16	1	1

Empirical formula \Rightarrow CH₃O

as compound is saturated acyclic so, molecular formula is C₂H₆O₂.



So, required moles of O₂ is \Rightarrow 5

- 22.** For the disproportionation reaction $2\text{Cu}^+(\text{aq}) \rightleftharpoons \text{Cu}(\text{s}) + \text{Cu}^{2+}(\text{aq})$ at K, $\ln K$ (where K is the equilibrium constant) is _____ $\times 10^{-1}$.

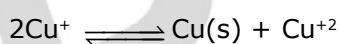
Given :

$$E^0_{\text{Cu}^{2+}/\text{Cu}^+} = 0.16 \text{ V}$$

$$E^0_{\text{Cu}^+/\text{Cu}} = 0.52 \text{ V}$$

$$\frac{RT}{F} = 0.025$$

Sol. 144



$$E^0 = 0.52 - 0.16 \\ = 0.36$$

$$E^0 = \frac{RT}{nF} \ln(k_{\text{eq}})$$

$$\ln(k_{\text{eq}}) = \frac{0.36}{0.025} \times \frac{1}{1} \\ = \frac{360}{25} = 14.4 \\ = 144 \times 10^{-1}$$

Ans. 144

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- 23.** The work function of sodium metal is 4.41×10^{-19} J. If photons of wavelength 300 nm are incident on the metal, the kinetic energy of the ejected electrons will be ($h = 6.63 \times 10^{-34}$ J s; $c = 3 \times 10^8$ m/s) _____ $\times 10^{-21}$ J.

Sol. 222

$$\phi = 4.41 \times 10^{-19} \text{ J}$$

$$\lambda = 300 \text{ nm}$$

$$KE_{\max} = \frac{hc}{\lambda} - \phi$$

$$= \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{300 \times 10^{-9}} - 4.41 \times 10^{-19}$$

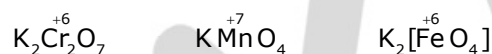
$$= 6.63 \times 10^{-19} - 4.41 \times 10^{-19}$$

$$= 222 \times 10^{-21}$$

Ans. 222

- 24.** The oxidation states of transition metal atoms in $K_2Cr_2O_7$, $KMnO_4$ and K_2FeO_4 , respectively, are x, y and z. The sum of x, y and z is _____.

Sol. 19



- 25.** The heat of combustion of ethanol into carbon dioxide and water is -327 kcal at constant pressure. The heat evolved (in cal) at constant volume and 27°C (if all gases behave ideally) is ($R = 2 \text{ cal mol}^{-1} \text{ K}^{-1}$) _____.

Sol. $\Delta H_c^0 [C_2H_5OH] = -327 \text{ kcal}$



$$\Delta E_c^0 = \Delta H_c^0 - \Delta ngRT$$

$$= -327 \times 1000 - (-1) \times 2 \times 300$$

$$= -327000 + 600$$

$$= -326400$$