Full Syllabus Test 2

Subject: Chemistry

1. For a d-electron, the orbital angular momentum is:

A. $\sqrt{6}\frac{h}{2\pi}$

B. $\sqrt{2}\frac{h}{2\pi}$

C. $\frac{h}{2\pi}$

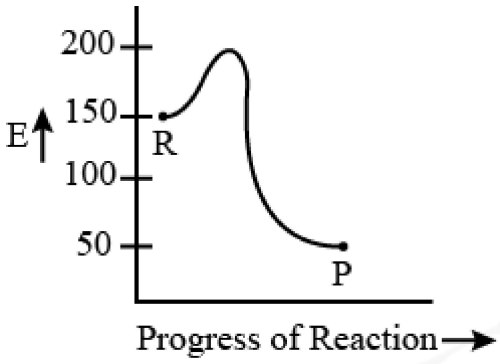
D. $2\left(\frac{h}{2\pi}\right)$

2. An exothermic chemical reaction proceeds by two stages:

$$\text{Reactants} \overset{\text{stage 1}}{\rightarrow} \text{Intermediate} \overset{\text{stage 2}}{\rightarrow} \text{Products}$$

The activation energy of stage 1 is $50\ \text{kJ/mol}$. The overall enthalpy change of the reaction is $-100\ \text{kJ/mol}$. Which diagram could represent the energy level diagram for the other reaction.

A.



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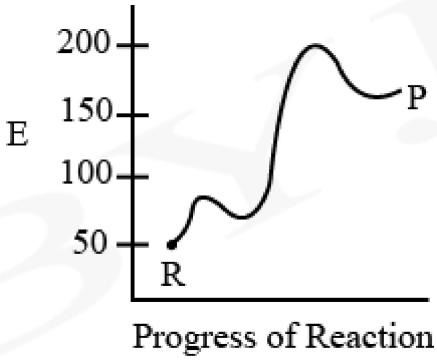

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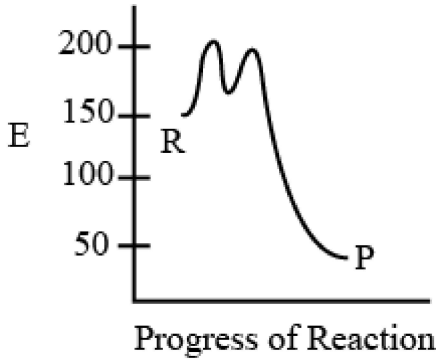

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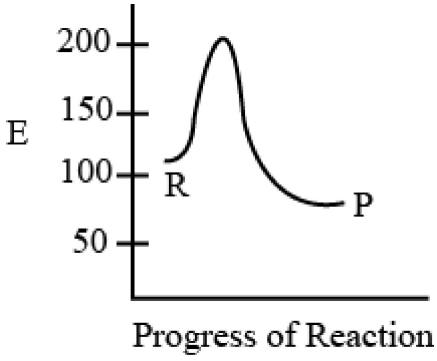


3. The species present in solution when CO_2 is dissolved in water are:

   A. $CO_2,\ H_2CO_3,\ HCO_3^-,\ CO_3^{2-}$

   B. $H_2CO_3,\ CO_3^{2-}$

   C. $HCO_3^-,\ CO_3^{2-}$

   D. $CO_2,\ H_2CO_3$

4. How many coulombs of electricity are required for the oxidation of 1 mole of H_2O to O_2?

   A. $9.65 \times 10^4\ C$

   B. $4.825 \times 10^4\ C$

   C. $1.93 \times 10^5\ C$

   D. $3.86 \times 10^5\ C$

5. The circulation of blood in the human body supplies O_2 and releases CO_2. The concentration of O_2 and CO_2 is variable but on an average, 100 ml blood contains 0.02 g of O_2 and 0.08 g of CO_2. The volume of O_2 and CO_2 at 1 atm and at body temperature 37° C, assuming 10 l blood in the human body is:

   A. $2\ \text{l},\ 4\ \text{l}$

   B. $1.5\ \text{l},\ 4.5\ \text{l}$

   C. $1.59\ \text{l},\ 4.62\ \text{l}$

   D. $3.82\ \text{l},\ 4.62\ \text{l}$

6. The nodal plane in the π-bond of ethene is located in:

   A. The molecular plane

   B. A plane parallel to the molecular plane

   C. A plane perpendicular to the molecular plane which bisects the $(C-C)$ σ-bond at a right angle

   D. A plane perpendicular to the molecular plane which contains the $(C-C)$ σ-bond

7. The strength of the bonds formed by overlapping of atomic orbitals is in the order:

   A. $s-s > s-p > p-p$

   B. $s-s > p-p > s-p$

   C. $s-p > s-s > p-p$

   D. $p-p > s-s > s-p$

8. Which among the following metals requires radiation of the shortest wavelength to cause emission of electrons?

   A. Na

   B. K

   C. Mg

   D. Ca

9. The reaction that takes place when Cl_2 gas is passed through conc. $NaOH$ solution is:

   A. Oxidation

   B. Reduction

   C. Displacement

   D. Disproportionation

10. When MnO_2 is fused with KOH, a coloured compound is formed. The compound and its colour are:

   A. K_2MnO_4, purple green

   B. $KMnO_4$, purple

   C. Mn_2O_3, brown

   D. Mn_3O_4, black

11. The EAN of Fe in $[Fe(C_2O_4)_3]^{3-}$ is:

   A. 27

   B. 24

   C. 35

   D. 29

12. The atomic number of V, Cr, Mn and Fe are $23, 24, 25$ and 26 respectively. Which one of these may be expected to have the highest second ionisation enthalpy?

A. V

B. Cr

C. Mn

D. Fe

13. Sulphur reacts with chlorine in $1:2$ ratio and forms (X). (X) on hydrolysis gives a sulphur compound (Y). What is the hybridisation of the central atom in the anion of (Y)?

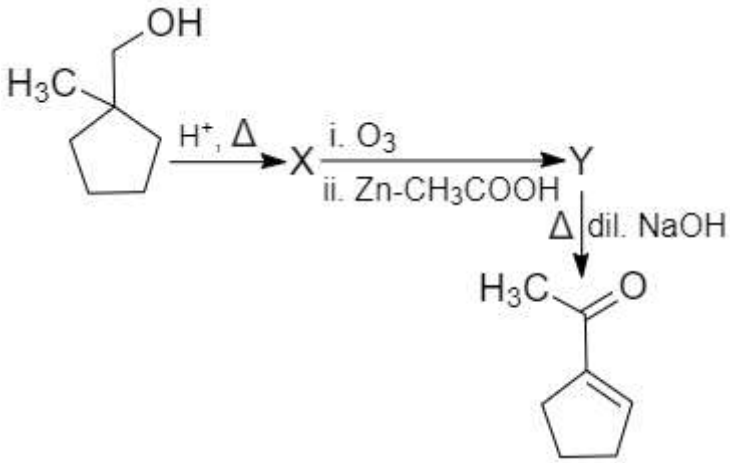
A. sp

B. sp^3

C. sp^2

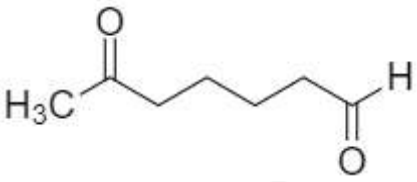
D. sp^3d

14.



Identify Y.

A.



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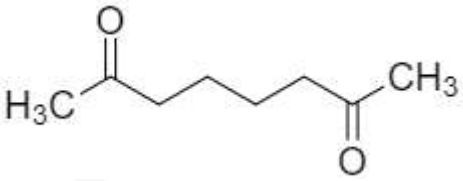

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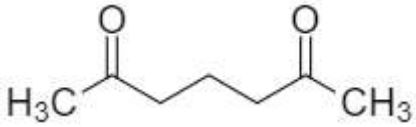

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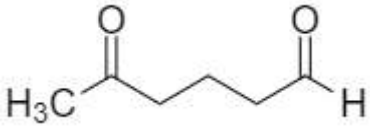


15. The effectiveness of an enzyme is least affected by:

A. Temperature

B. Concentraction of the substrate

C. Original activation energy of the system

D. Concentration of the enzyme

16. The best method to prepare cyclohexene from cyclohexanol is by using:

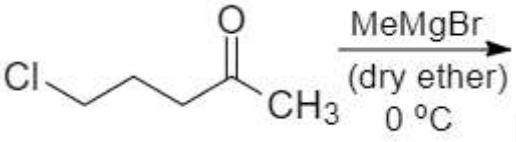
A. Conc. $HCl + ZnCl_2$

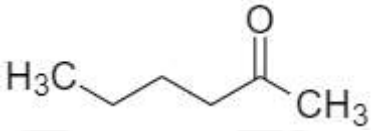
B. Conc. H_3PO_4/Δ

C. HBr

D. Conc. HCl

17. The major product in the following reaction is:



A.


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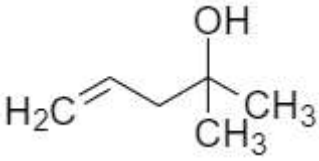

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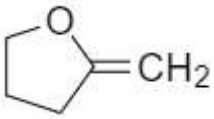

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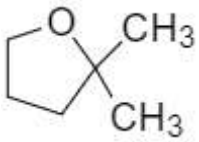


18. $PhOH \xrightarrow[NaOH]{Me_2SO_4} P$

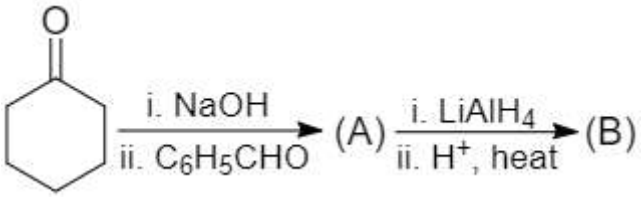
'P' is:

A. $Ph - O - SO_2OMe$

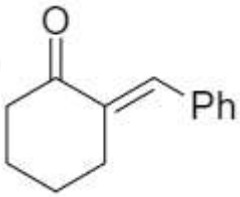
B. $PhOMe$

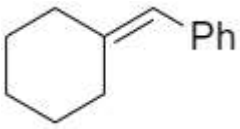
C. $PhOSO_2OPh$

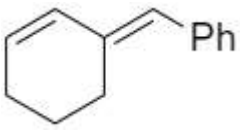
D. $PhMe$

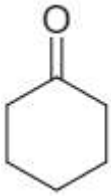
19. 

For the above reaction, addition of $LiAlH_4$ in dry ether takes place at low temperature $(-10\ ^oC)$. What would be the product (B)?

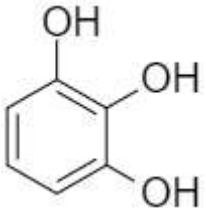
A. 

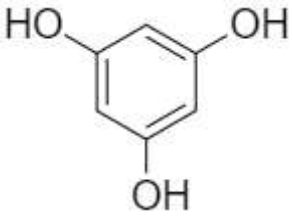
B. 

C. 

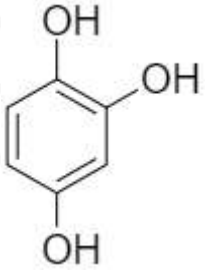
D. 

20. What is the product formed when Gallic acid is heated?

A. 

B. 

C. 

D. 

21. $(\Delta H - \Delta U)$ in J/mol for the formation of carbon monoxide (CO) from its elements at $300\ \mathrm{K}$ is:$R = \frac{25}{3}\mathrm{J/Kmol}$

22. An ionic compound AB has a ZnS type of structure, if the radius A^+ is 22.5 pm, then the ideal radius of B^- so as not to cause any distortion is (in pm):

23. What volume of hydrogen gas (in litres) at 273 K and 1 atm pressure will be consumed to obtain 21.6 g of elemental boron (atomic mass = 10.8) from the reduction of boron trichloride by hydrogen?

24. If the number of possible isomers for the compound $C_2FClBrI$ is x, then $x \times 2$ is:

25. How many moles of H_3PO_4 are obtained by hydrolysing two moles of P_4O_8?

26. The number of types of monochloroalkanes formed by chlorination of isobutane is:

27. Number of triclinic crystal system among the following
Graphite, ZnO, CdS, $(PbCO_3)$, HgS (cinnabar), $K_2Cr_2O_7$, $CuSO_4.5H_2O$, H_3BO_3

28. What is the percentage of enantiomeric excess of a mixture containing 12.8 mol (R)-2-bromobutane and 3.2 mol (S)-2-bromobutane?

29. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g); \Delta H = -22\, kcal$
Activation energy, E_a for the given reaction is $70\ kcal$. Find the activation energy for $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$ in $kcal$.

30. The resistance of a conductivity cell containing $0.0001\ M\ KCl$ solution at $298\ K$ is $1500\ \Omega$
. What is the cell constant (in cm^{-1}) if conductivity of $0.0001\ M\ KCl$ solution at $298\ K$ is $0.146 \times 10^{-3}\ \mathrm{S\ cm^{-1}}$.