CHEMISTRY

BOOKS - SURA CHEMISTRY (TAMIL ENGLISH)

GOVT. MODEL QUESTION PAPER - I

Part A

1. Which one of the following is a standard for atomic mass ?

A. ${}_6C^{12}$

B. ${}_6C^{14}$

C. ${}_6C^{13}$

D. ${}_6C^{14}$

Answer: A

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2. The equivalent mass of a divalent metal element is $10eq^{-1}$. The molar mass of its anhydrous oxide is

A. 46 g

B. 36 g

C. 52 g

D. none of these

Answer: C

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3. Consider the following sets of quantum numbers

	n	l	m	s
(i)	2	1	-1	$3/2$
(ii)	1	1	1	$+1/2$
(iii)	1	0	$+1$	$-1/2$
(iv)	1	0	0	$-1/2$

which of the following sets of quantum number is not possible ?

A. (i) and (ii)

B. (ii) and (iv)

C. (i) , (ii) and (iii)

D. (i) ,(ii) (iii) and (iv)

Answer: C

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4. Based on equation $E = -3.178 \times 10^{-18}\left(\frac{Z^2}{n^2}\right)$ J certain conclusions are written. Which of them is not correct?

A. Equation can be used to calculate the energy change when the electron changes orbit.

B. For n = 3 , then electron has more negative energy than it does for n = 5 which means that the electron is more tightly bound in the smallest allowed orbit.

C. The negative sign in the equation simply means that the energy of electron bound to

the nucleus is lower it would be if electrons were at the infinite distance from nucleus.

D. Smaller the value of n , the larger is the orbit radius.

Answer: D

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5. Which of the following pairs of elements exhibit diagonal relationship ?

A. Be and Mg

B. Be and Al

C. Be and B

D. C and Si

Answer: B

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6. The first ionization energy (IE_1) and second ionization energy (IE_2) of elements A,B and C are given below

Element	A	B	C
$IE_1 kJmol^{-1}$	2370	522	1680
$IE_2 kJmol^{-1}$	5250	7298	3381

Which one of above elements is the most reactive metal ?

A. A

B. B

C. C

D. A and C

Answer: B

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7. Ionic hydrides are formed by

A. halogens

B. halogens

C. alkalimetals

D. inert gases

Answer: C

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8. Volume strength of $0.5NH_2O_2$ is

A. 2.8

B. 8.4

C. 5.6

D. 16.8

Answer: A

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9. Ionic radius of alkali metals are in the following order

A. $LI < Na < K < Rb < Cs$

B. $Na < Li < K < Rb < Cs$

C. $LI > Na > K > Rb > Cs$

D. $Na < Li < Rb < K < Cs$

Answer: A

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10. Which one the following is true ?

A. Lithium on direct combination with nitrogen from Li_3N

B. Magnesium on direct combination with nitrogen from Mg_3N

C. Both (a) and (b)

D. Lithium and magnesium from bicarbonates.

Answer: C

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11. Which of the following correctly represents Boyle's Law ?

A. 

B. 

C. 

D. 

Answer: A

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12. What is the density of oxygen gas at $227^{\circ}C$ and 4 atm pressure (R=0.082 L atom $K^{-1}mol^{-1}$)

A. $3.12g/L$

B. $3.41g/L$

C. $2.81g/L$

D. none of these

Answer: A

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13. Which one the following is an extensive property ?

A. Molar Volume

B. Molality

C. Gibbs free energy

D. Free energy change

Answer: C

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14. Pressure - Volume work involved in an isothermal compression is

A. $-2.303nRT\log\left(\frac{V_f}{V_i}\right)$

B. $2.303nRT\log\left(\frac{V_f}{V_i}\right)$

C. $-\int_{vi}^{vf} V dv$

D. $\left(\frac{\Delta V}{\Delta T}\right)$

Answer: B

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15. An ideal gas expands from the volume of $1 \times 10^{-3} m^3$ to $1 \times 10^{-2} m^3$ at $300K$ against a constant pressure at $1 \times 10^5 Nm^{-2}$. The work done is

A. $-900J$

B. $900KJ$

C. $270kJ$

D. $-9000kJ$

Answer: C

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Part B

1. Define equivalent mass

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2. Consider the following electronic arrangement for p^3 configuration .

A. 

B. 

C. 

D. 

Answer: A

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3. Calculate the De-Broglie wavelength of a particle whose momentum is $66.26 \times 10^{-28} kgms^{-1}$.

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4. Is the definition given below for ionisation enthalphy correct ?

Ionisation enthalphy is defined as the energy

required to remove the most loosely bound electron from the valence shell of an atom

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5. What is meant by intramolecular hydrogen bond? Give one example

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6. Complete the following chemical reactions and classify them in to (a) hydrolysis (b) redox

(c) hydration reactions.

$CaO + H_2O \rightarrow$

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7. Given the reaction of sodium ethyne.

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8. Distinguish between diffusion and effusion.

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9. One mole of an ideal gas is put through a series fo changes as shown below in a cyclic process

Name the process $A \to B, B \to C$ and $C \to A$.

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Part C

1. Assertion : Two mole of glucose contains 12.044×10^{23} molecules of glucose.

Reason : Total number of entities present in one mole of any substance is equal to 6.022×10^{22}

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2. Calculate the total number of electrons present in 17g of ammonia.

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3. 

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4. First ionisation potential of C- atom is greater than that of B atom , where as the revers is true is

for second ionisation potential.

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5. Atomic number of elements X,Y,Z and A are 4,8,7 and 12 respectivity . Arrange them in the decreasing order of their electronegativity.

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6. Mention the uses of heavy water .

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7. How is plaster of paris prepared ?

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8. At identical temperature and pressure, the rate of diffusion of hydrogen gas is $3\sqrt{3}$ times that of a hydrocarbon having molecular formula C_nH_{2n-2}. What is the value of n ?

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9. State the first law of thermodynamics.

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Part D

1. Define oxidation number. Balance the following equation using oxidation number method.

$$As_2S_3 + HNO_3 + H_2O \rightarrow H_3AsO_4 + H_2SO_4 + NO$$

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2. Define limiting reagent .

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3. The reaction between aluminium and ferric oxide can generate temperatures up to 3273 K and is used in welding metals. (Atomic mass of Al = 27 u Atomic mass of O = 16 u) $2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$, If, in this process, 324 g of aluminium is allowed to react with 1.12 kg of ferric oxide.

(i) Calculate the mass of Al_2O_3 formed.

(ii) How much of the excess reagent is left at the end of the reaction?

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4. Describe Aufbau principle . Write the electronic configuration for Ni^{2+} using Aufbau principle.

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5. What is the de Broglie wave lenght of an electron, which is accelerated from the rest, through a potential difference of 100 V?

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6. Given the relation between Bohr radius (r) and the de Broglie wavelength (λ)

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7.

Explain the above variations of electron affinity

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8.

Define electronegativity.

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9. What is water-gas shift reaction?

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10. NH_3 has exceptionally high melting point and boiling point as compared to those of the hydrides of the remaining element of group 15. Explain.

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11. Hydrogen peroxide can function as an oxidising agent as well as reducing agent. Substantiate this statement with suitable examples.

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12. Discuss the three types of Covalent hydrides

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13. Alk aline earth metal (A), belongs to 3rd period reacts with oxygen and nitrogen to form compound

(B) and (C) respectively. It undergo metal displacement reaction with $AgNO_3$ solution to form compound (D).

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14. Why sodium hydroxide is much more water soluble than chloride?

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15. Write the Van der Waals equation for a real gas. Explain the correction term for pressure and

volume.

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16. Calculate ΔH_f° for the reaction $CO_2(g) + H_2(g) \rightarrow CO(g) + H_2O(g)$ given that ΔH_f^0 for $CO_2(g), CO(g)$ and $H_2O(g)$ are -393.5 , -111.31 and -242kJ mol^{-1} respectively.

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Part I

1. Which one of the following is used as a standard for atomic mass.

A. $._6 C^{12}$

B. $._7 C^{12}$

C. $._6 C^{13}$

D. $._6 C^{14}$

Answer: A

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2. Consider the following sets of quantum numbers

	n	1	m	s
(i)	2	1	-1	$3/2$
(ii)	1	1	1	$+1/2$
(iii)	1	0	$+1$	$-1/2$
(iv)	1	0	0	$-1/2$

Which of the following sets of quantum numbers is not possible ?

A. (i) and (ii)

B. (ii) and (iv)

C. (i), (ii) and (iii)

D. (i), (ii), (iii) and (iv)

Answer: C

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3. The electronic configuration of the elements A and B are $1s^2, 2s^2, 2p^6, 3s^2$ and $1s^2, 2s^2, 2p^5$ respectively . The formula of the ionic compound that can be formed between these elements is

A. AB

B. AB_2

C. A_2B

D. none of the above.

Answer: B

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4. Which one of the following statements is incorrect with regard to ortho and para dihydrogen ?

A. They are stereo isomers

B. Ortho isomer has zero nuclear spin whereas the para isomer has one nuclear spin

C. The para isomer is favoured at low temperatures

D. All of these

Answer: B

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5. The compound (X) on heating gives a colourless gas a nd a residue that is dissolved in water to obtain (B). Excess of CO_2 is bubbled through aqueous solution of B, C is formed. Solid (C) on heating gives back X. (B) is

A. $CaCO_3$

B. $Ca(OH)_2$

C. Na_2CO_3

D. $NaHCO_3$

Answer: B

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6. Which of the following is the correct representation of Charles's law ?

A. 

B. 

C. 

D. 

Answer: C

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7. For one mole of an ideal gas, $\left(\frac{\partial H}{\partial T}\right)_P - \left(\frac{\partial U}{\partial T}\right)$ is equal to

A. 2.303 R

B. $8.314 dm^3 \text{atm mol}^{-1}$

C. 0.0821 lit atm $mol^{-1}K^{-1}$

D. 2.303 log R

Answer: C

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8. For a reaction $AX_5 \Leftrightarrow AX_2, 1\%$ of AX_5 is dissociated at a total pressure of 1 atm, the equilibrium constant K_P is approximately equal to

A. 10^{-3}

B. 10^{-4}

C. 0.1×10^{-4}

D. 1

Answer: B

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9. For an ideal solution

A. $\Delta V_{\text{mix}} = 0$

B. $\Delta V_{\text{mix}} \neq 0$

C. $\Delta V_{\text{mix}} > 0$

D. $\Delta V_{\text{mix}} < 0$

Answer: A

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10. Assertion: Oxygen molecule is paramagnetic.

Reason: It has two unpaired electron in its bonding molecular orbital

A. both assertion and reason are true and reason is the correct explanation of assertion

B. both assertion and reason are true but reason is not the correct explanation of assertion

C. assertion is true but reason is false

D. Both assertion and reason are false

Answer: C

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11. The general formula for alkadience is

A. C_nH_{2n}

B. C_nH_{2n-1}

C. C_nH_{2n-2}

D. C_nH_{n-2}

Answer: C

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12. Which of the group has highest +I effect ?

A. CH_3^-

B. $CH_3 - CH_2 -$

C. $(CH_3)_2 - CH -$

D. $(CH_3)_3 - C -$

Answer: D

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13. $(CH_3)_2C = C(CH_3)_2 \xrightarrow[(ii)\ Zn/H_2O]{(i)\ O_3} X$. X is

A. Acetic acid

B. propanone

C. acetaldehyde

D. Organo zinc compound

Answer: B

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14. Ethanol reacts with methyl magnesium bromide to form

A. Ethane

B. methanol

C. propanone

D. methane

Answer: D

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15. Haemoglobin of the blood forms carboxy haemoglobin with

A. Carbon dioxide

B. carbon tetra chloride

C. carbon monoxide

D. carbamic acid

Answer: C

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Part Ii

1. Predict the oxidation state of carbon in each of the following compounds.

CH_4

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2. Predict the oxidation state of carbon in each of the following compounds.

CCl_4

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3. A macroscopic particle of mass one Kg is moving at a velocity $10ms^{-1}$ calculate its de Broglie wavelength.

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4. Write balanced chemical equation for each of the following chemical reactions.

heating calcium carbonate

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5. Write balanced chemical equation for each of the following chemical reactions.

Lithium metal with nitrogen gas

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6. Distinguish between diffusion and effusion.

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7. The mass of a non-volatile solute (molar mass 80 g mol^{-1}) which should be dissolved in 92g of

toluene to reduce its vapour pressure to $90\ \%$

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8. Predict the shape of ClF_3 and NH_3 using VSEPR theory.

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9. Given one example for β - elemination reaction.

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10. Draw Cis - Trans isomers for 2,3 dichloro - 2 - butene.

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11. Given any two harmful effects of acid rain.

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Part Iii

1. Define ionization energy. The first ionization energy of Nitrogen is greater than that of Oxygen - give appropriate reason.

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2. Write the equation involved in the preparation of hydrogen peroxide from 2 - ethylanthraquinol.

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3. Discuss briefly the similarities between beryllium and aluminium

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4. Calculate ΔH_f° for the reaction $CO_2(g) + H_2(g) \rightarrow CO(g) + H_2O(g)$ given that ΔH_f^0 for $CO_2(g), CO(g)$ and $H_2O(g)$ are -393.5 , -111.31 and -242kJ mol^{-1} respectively.

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5. Define Molarity. If 5.6 g of KOH is present in 250 ml of the solution, calculate the molarity of the solution.

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6. Define equilibrium constant. Given any one application of equilibrium constant.

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7. 0.30 g of a substance gives 0.88 g of carbon dioxide and 0.54 g water. Calculate the percentage of carbon and hydrogen in it.

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8. Given any two methods for the preparation of halo alkanes from alcohols.

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9. Write a note on

Birch reduction

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10. Write a note on

Friedel craft's acylation

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Part Iv

1. An organic compound present in vinegar has 40% carbon , 6.6% hydrogen and 53.4% oxygen. Find the empirical formula of the compound.

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2. Exaplin the uses of plaster of paris.

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3. describe the Aufbau principle.

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4. Write the the electronic configuration of Fe^{2+} ion.

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5. How many radial nodes exist in 2s and 4f orbitals

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6. Explain the pauling method for the determination os ionic radius.

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7. Write a note on deuterium exchange reactions.

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8. Describe fajan's rule.

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9. Draw the Lewis dot structures for sulphurtrioxide.

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10. Find the missing parameters.

$P = 1atm$	$P = 1atm$	$P = 1atm$
$V_1 = 0.3dm^3$	$V_2 = \ ?$	$V_3 = 0.15dm^3$
$T_1 = 200K$	$T_2 = 300K$	$T_3 = \ ?\, K$

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11. State Le-Chatelier principle.

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12. In the equilibrium,

$2A(g) \Leftrightarrow 2B(g) + C_2(g)$

the equilibrium concentrations of A, B and C_2 at

400 K are

$1 \times 10^{-4} M, 2.0 \times 10^{-3} M, 1.5 \times 10^{-4} M$

respectively. The value of K_C for the equilibrium at 400 K is

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13. What are state and path functions? Give two examples.

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14. Give the IUPAC names of the following compounds.

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15. Give the IUPAC names of the following compounds.

$H_3C - CH_2 - COOH$

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16. Give the IUPAC names of the following compounds.

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17. Give the structures for the following compound

3-chlorobutanol

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18. Give the structures for the following compound

Acctaldehyde

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19. Explain Markovnikoff's rule with suitable example

.

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20. Describe the mcchanism of addition of HBr to propene,

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21. Write a short note on the following

Dow's process

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22. Write a short note on the following

Darzan's process

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23. What is green chemistry ?

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24. Write a short note on the following

Hyper conjugation

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25. Write a short note on the following

Osmotic pressure

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26. Write a short note on the following

Molar mass

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