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Previous Year Paper

Chemistry - 2014



Multiple Choice Questions

1. The emission spectrum of hydrogen discovered first and the region of the electromagnetic spectrum in which it belongs, respectively are
- A. Lyman, ultraviolet
 - B. Lyman, visible
 - C. Balmer, ultraviolet
 - D. Balmer, visible

Answer

2. The electronic configuration of Cu is
- A. $[\text{Ne}] 3s^2, 3p^6, 3d^9, 4s^2$
 - B. $[\text{Ne}] 3s^2, 3p^6, 3d^{10}, 4s^1$
 - C. $[\text{Ne}] 3s^2, 3p^6, 3d^3, 4s^2, 4p^6$
 - D. $[\text{Ne}] 3s^2, 3p^6, 3d^5, 4s^2, 4p^4$

Answer

3. As per de-Broglie's formula a macroscopic particle of mass 100 g and moving at a velocity of 100 cm s^{-1} will have a wavelength of
- A. $6.6 \times 10^{-29} \text{ cm}$
 - B. $6.6 \times 10^{-30} \text{ cm}$
 - C. $6.6 \times 10^{-31} \text{ cm}$
 - D. $6.6 \times 10^{-32} \text{ cm}$

Answer

4. For one mole of an ideal gas, the slope of V vs. T curve at constant pressure of 2 atm is $X \text{ L mol}^{-1} \text{ K}^{-1}$. The value of the ideal universal gas constant 'R' in terms of X is
- A. $X \text{ L atm mol}^{-1} \text{ K}^{-1}$
 - B. $x/2 \text{ L atm mol}^{-1} \text{ K}^{-1}$
 - C. $2X \text{ L atm mol}^{-1} \text{ K}^{-1}$
 - D. $2X \text{ atm L}^{-1} \text{ mol}^{-1} \text{ K}^{-1}$

Answer

5. At a certain temperature the time required for the complete diffusion of 200 mL of H_2 gas is 30 min. The time required for the complete diffusion of 50 mL of O_2 gas at the same temperature

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A. 60min

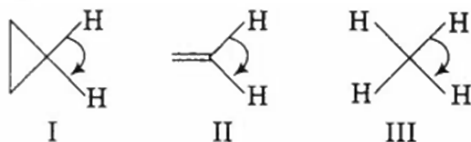
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C. 45min

D. 15min

Answer

6. The correct order of decreasing H-C-H angle in the following molecule is



A. I > II > III

B. II > I > III

C. III > II > I

D. I > III > II

Answer

7. During the emission of a positron from a nucleus, the mass number of the daughter element remains the same but the atomic number

A. is decreased by 1 unit

B. is decreased by 2 units

C. is increased by 1 unit

D. remains unchanged

Answer

8. β -emission is always accompanied by

A. formation of antineutrino and α -particleB. emission of α -particle and γ -rayC. formation of antineutrino and γ -ray

D. formation of antineutrino and positron

Answer

9. Four gases P, Q, R and S have almost same values of 'b' but their 'a' values (a, b are van der Waals' constants) are in the order $Q < R < S < P$. At a particular temperature, among the four gases, the most easily liquefiable one is

A. P

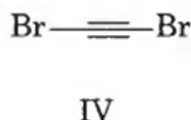
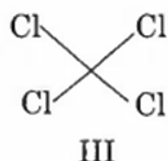
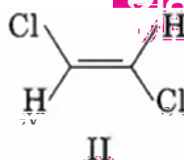
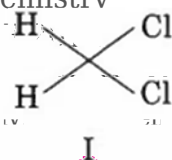
B. Q

C. R

D. S

Answer

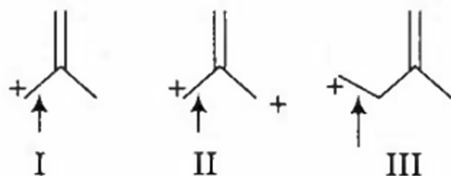
10. The compound that will have a permanent dipole moment among the following is



- A. I
- B. II
- C. III
- D. IV

Answer

11. The correct order of decreasing length of the bond as indicated by the arrow in the following structures is



- A. I > II > III
- B. II > I > III
- C. III > II > I
- D. I > III > II

Answer

12. An atomic nucleus having low n/p ratio tries to find stability by
- A. the emission of an α -particle
 - B. the emission of a positron
 - C. capturing an orbital electron (K-electron capture)
 - D. emission of a β -particle

Answer

13. ($^{63}_{32}\text{Ge}$, $^{64}_{32}\text{Ge}$) and ($^{30}_{14}\text{Si}$, $^{31}_{14}\text{Si}$) are example of
- A. isotopes and isobars
 - B. isobars and isotones
 - C. isotones and isotopes
 - D. isobars and isotopes

Answer

14. $^{246}_{98}\text{Cf}$ was formed along with a neutron when an unknown radioactive substance was

bombarded with $^{12}_6\text{C}$. The unknown substance was

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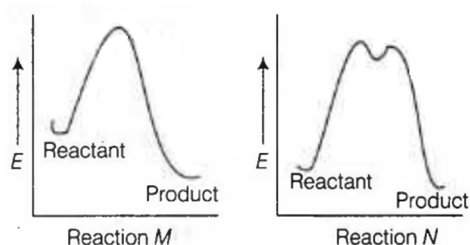
Answer

15. The values of ΔH and ΔS of a certain reaction are -400 kJ mol^{-1} and $-20 \text{ kJ mol}^{-1}\text{K}^{-1}$ respectively. The temperature below which the reaction is spontaneous, is

- A. 100 K
- B. 20°C
- C. 20 K
- D. 120°C

Answer

16. The correct statement regarding the following energy diagrams is



- A. Reaction M is faster and less exothermic than reaction N
- B. Reaction M is slower and less exothermic than reaction N
- C. Reaction M is faster and more exothermic than reaction N
- D. Reaction M is slower and more exothermic than reaction N

Answer

17. Commercial sample of H_2O_2 is labeled as 10 V. Its % strength is nearly

- A. 3
- B. 6
- C. 9
- D. 12

Answer

18. The enthalpy of vaporisation of a certain liquid at its boiling point of 35°C is $24.64 \text{ kJ mol}^{-1}$. The value of change in entropy for the process is

- A. $704 \text{ JK}^{-1}\text{mol}^{-1}$
- B. $80 \text{ JK}^{-1}\text{mol}^{-1}$
- C. $24.64 \text{ JK}^{-1}\text{mol}^{-1}$
- D. $7.04 \text{ JK}^{-1}\text{mol}^{-1}$



The heat of formation of carbon monoxide will be

- A. $y - 2x$
- B. $y + 2x$
- C. $2x - y$
- D. $2x - y/2$

Answer

20. In case of heteronuclear diatomics of the type AB, where A is more electronegative than B, bonding molecular orbital resembles the character of A more than that of B. The statement
- A. is false
 - B. is true
 - C. cannot be evaluated since data is not sufficient
 - D. is true only for certain systems

Answer

21. The value of ΔH for cooling 2 mole of an ideal monoatomic gas from 225°C to 125°C at constant pressure will be [given $C_p = 5/2R$].
- A. $250 R$
 - B. $-500 R$
 - C. $500R$
 - D. $-250 R$

Answer

22. The pH of 10^{-4} M KOH solution will be
- A. 4
 - B. 11
 - C. 10.5
 - D. 10

Answer

23. The system that contains the maximum number of atoms is
- A. 4.25 g of NH_3
 - B. 8 g of O_2
 - C. 2g of H_2
 - D. 4g of He

Answer

24. The compressibility factor (Z) of one mole of a van der Waals' gas of negligible 'a' value is
- A. 1
 - B. $bpRT$
 - C. $1 + bpRT$

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Answer

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25. The volume of ethyl alcohol (density 1.15 g/cc) that has to be added to prepare 100 cc of 0.5 M ethyl alcohol solution in water is
- A. 1.15 cc
 - B. 2 cc
 - C. 2.15 cc
 - D. 2.30 cc

Answer

26. The bond angle in NF_3 (102.3°) is smaller than NH_3 (107.2°). This is because of
- A. large size of F compared to H
 - B. large size of N compared to F
 - C. opposite polarity of N in the two molecules
 - D. small size of H compared to N

Answer

27. The structure of XeF_6 is experimentally determined to be distorted octahedron. Its structure according to VSEPR theory is
- A. octahedron
 - B. trigonal bipyramid
 - C. pentagonal bipyramid
 - D. tetragonal bipyramid

Answer

28. Two gases X (molecular weight M_x) and Y (molecular weight M_y ; $M_y > M_x$) are at the same temperature T in two different containers. Their root mean square velocities are C_x and C_y respectively. If the average kinetic energies per molecule of two gases X and Y are E_x and E_y respectively then which of the following relation(s) is(are) true?
- A. $E_x > E_y$
 - B. $C_x > C_y$
 - C. $E_x = E_y = (3/2)RT$
 - D. $E_x = E_y = (3/2)k_B T$

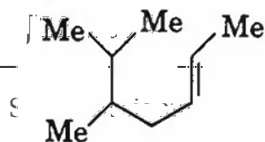
Answer

29. For a spontaneous process, the correct statement(s) is (are)
- A. $(\Delta G_{\text{system}})_{T,p} > 0$
 - B. $(\Delta S_{\text{system}}) + (\Delta S_{\text{surrounding}}) > 0$
 - C. $(\Delta G_{\text{system}})_{T,p} < 0$
 - D. $(\Delta U_{\text{system}})_{T,V} > 0$

Answer

30. The IUPAC name of the following molecule is

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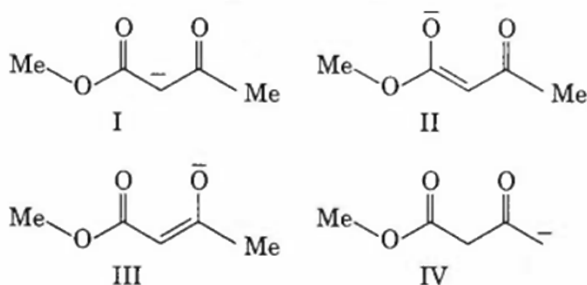


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- A. 5,6-dimethylhept-2-ene
- B. 2,3-dimethylhept-5-ene
- C. 5,6-dimethylhept-3-ene
- D. 5-iso-propylhex-2-ene

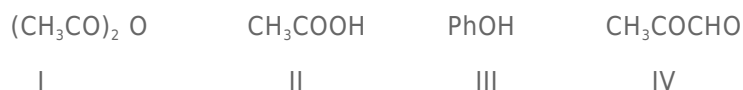
Answer

31. Among the following structures the one which is not a resonating structure of others is



- A. I
- B. II
- C. III
- D. IV

Answer

32. Among the following compounds, the one(s) that gives (give) effervescence with aqueous NaHCO_3 solution is (are)

- A. I and II
- B. I and III
- C. Only II
- D. I and IV

Answer

33. The 4th higher homologue of ethane is

- A. butane
- B. pentane
- C. hexane
- D. heptane

Answer

34. Among the following, the one which is not a "green house gas", is

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C. CH_4

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D. O_2

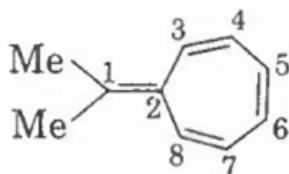
Answer

35. Metal ion responsible for the Minimata disease is

A. Co^{2+} B. Hg^{2+} C. Cu^{2+} D. Zn^{2+}

Answer

36. The most likely protonation site in the following molecule is



A. C-1

B. C-2

C. C-3

D. C-6

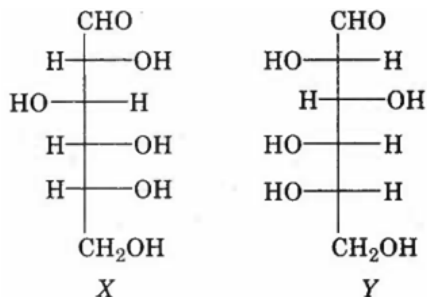
Answer

37. The order of decreasing ease of abstraction of hydrogen atoms in the following molecules

A. $\text{H}_a > \text{H}_b > \text{H}_c$ B. $\text{H}_a > \text{H}_c > \text{H}_b$ C. $\text{H}_b > \text{H}_a > \text{H}_c$ D. $\text{H}_c > \text{H}_b > \text{H}_a$

Answer

38. Among the following statements about the molecules X and Y, the one(s) which correct is (are)



A. X and Y are diastereomers

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C. X and Y are both aldohexoses

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D. X is a D-sugar and Y is an L-sugar

Answer

39. The rate of a certain reaction is given by, $\text{rate} = k [\text{H}^+]^n$. The rate increases 100 times when the pH changes from 3 to 1. The order (n) of the reaction is
- A. 2
B. 0
C. 1
D. 1.5

Answer

40. If Cl_2 is passed through hot aqueous NaOH , the products formed have Cl in different oxidation states. These are indicated as
- A. -1 and +1
B. -1 and +5
C. +1 and +5
D. -1 and +3

Answer

41. The hydrides of the first elements in groups 15-17, namely NH_3 , H_2O and HF respectively show abnormally high values for melting and boiling points. This is due to
- A. small size of N, O and F
B. the ability to form extensive intermolecular H-bonding
C. the ability to form extensive intramolecular H-bonding
D. effective van der Waals' interaction

Answer

42. The quantity of electricity needed to separately electrolyze 1 M solution of ZnSO_4 , AlCl_3 and AgNO_3 completely is in the ratio of
- A. 2 : 3 : 1
B. 2 : 1 : 1
C. 2 : 1 : 3
D. 2 : 2 : 1

Answer

43. The amount of electrolytes required to coagulate a given amount of AgI colloidal solution (-ve charge) will be in the order
- A. $\text{NaNO}_3 > \text{Al}_2(\text{NO}_3)_3 > \text{Ba}(\text{NO}_3)_2$
B. $\text{Al}_2(\text{NO}_3)_3 > \text{Ba}(\text{NO}_3)_2 > \text{NaNO}_3$
C. $\text{Al}_2(\text{NO}_3)_3 > \text{NaNO}_3 > \text{Ba}(\text{NO}_3)_2$
D. $\text{NaNO}_3 > \text{Ba}(\text{NO}_3)_2 > \text{Al}_2(\text{NO}_3)_3$

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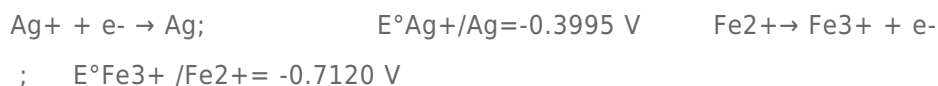
44. Among the following observations, the correct one that differentiates between SO_3^{2-} and SO_4^{2-} is

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- A. both form precipitate with BaCl_2 , SO_3^{2-} dissolves in HCl but SO_4^{2-} does not.
- B. SO_3^{2-} forms precipitate with BaCl_2 , SO_4^{2-} does not.
- C. SO_4^{2-} forms precipitate with BaCl_2 , SO_3^{2-} does not
- D. both form precipitate with BaCl_2 , SO_4^{2-} dissolves in HCl but SO_3^{2-} does not.

Answer

45. The two half-cell reactions of an electrochemical cell is given as



The value of cell EMF will be

- A. -0.3125 V
- B. 0.3125 V
- C. 1.114 V
- D. -1.114V

Answer

46. At 25°C , the molar conductance of 0.007 M hydrofluoric acid is $150 \text{ mho cm}^2\text{mol}^{-1}$ and its $\lambda^\circ\text{m} = 500 \text{ mho cm}^2\text{mol}^{-1}$. The value of the dissociation constant of the acid at the given concentration at 25°C is

- A. $7 \times 10^{-4} \text{ M}$
- B. $7 \times 10^{-5} \text{ M}$
- C. $9 \times 10^{-3} \text{ M}$
- D. $9 \times 10^{-4} \text{ M}$

Answer

47. To observe an elevation of boiling point of 0.05°C , the amount of a solute (mol. wt. = 100) to be added to 100 g of water ($K_b = 0.5$) is

- A. 2 g
- B. 0.5 g
- C. 1 g
- D. 0.75 g

Answer

48. A piece of wood from an archaeological sample has $5.0 \text{ counts min}^{-1}$ per gram of C-14 , while a fresh sample of wood has a count of $15.0 \text{ min}^{-1}\text{g}^{-1}$. If half-life of C-14 is 5770 yr , the age of the archaeological sample is

- A. $8,500 \text{ yr}$

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C. 10,000 yr

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D. 11,000 yr

Answer

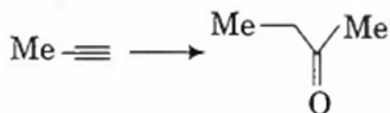
49. The formal potential of $\text{Fe}^{3+}/\text{Fe}^{4+}$ in a sulphuric acid and phosphoric acid mixture ($E^\circ = +0.61\text{ V}$) is much lower than the standard potential ($E^\circ = +0.77\text{ V}$). This is due to
- A. formation of the species $[\text{FeHPO}_4]^+$
 - B. lowering of potential upon complexation
 - C. formation of the species $[\text{FeSO}_4]^+$
 - D. high acidity of the medium

Answer

50. Cupric compounds are more stable than their cuprous counterparts in solid state. This is because
- A. the endothermic character of the 2nd IP of Cu is not so high
 - B. size of Cu^+ is less than Cu^{2+}
 - C. Cu^{2+} has stabler electronic configuration as compared to Cu^+
 - D. the lattice energy released for cupric compounds is much higher than Cu^+

Answer

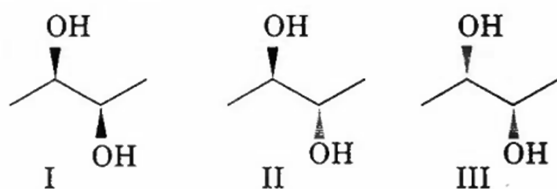
51. The reagents to carry out the following conversion are



- A. $\text{HgSO}_4/\text{dil H}_2\text{SO}_4$
- B. $\text{BH}_3; \text{H}_2\text{O}_2/\text{NaOH}$
- C. $\text{OsO}_4; \text{HIO}_4$
- D. $\text{NaNH}_2/\text{CH}_3\text{I}; \text{HgSO}_4/\text{dil H}_2\text{SO}_4$

Answer

52. The correct statement regarding the following compounds is

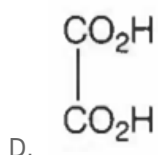
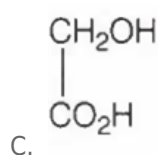
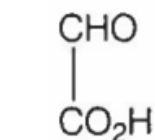
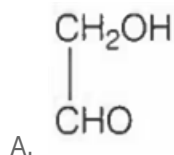
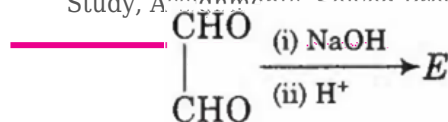


- A. all three compounds are chiral
- B. only I and II are chiral
- C. I and III are diastereomers
- D. only I and II are chiral

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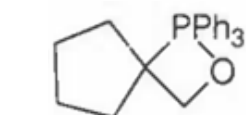
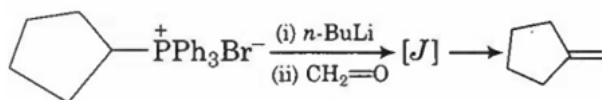
53. In the following reaction, the product E is

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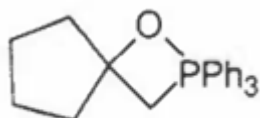


Answer

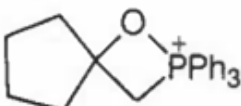
54. The intermediate J in the following Wittig reaction is



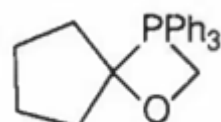
A.



B.



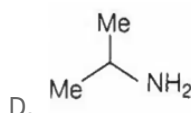
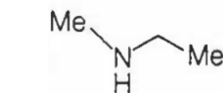
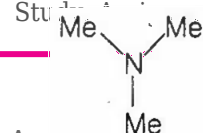
C.



D.

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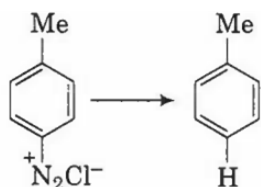
Answer

56. The number of amino acids and number of peptide bonds in a linear tetrapeptide (made of different amino acids) are respectively.

- A. 4 and 4
- B. 5 and 5
- C. 5 and 4
- D. 4 and 3

Answer

57. The reagent with which the following reaction is best accomplished is



- A. H_3PO_2
- B. H_3PO_3
- C. H_3PO_4
- D. NaHSO_3

Answer

58. In DNA, the consecutive deoxynucleotides are connected via

- A. phosphodiester linkage
- B. phosphomonoester linkage
- C. phosphotriester linkage
- D. amide linkage

Answer

59. The reaction of aniline with chloroform under alkaline conditions leads to the formation of

A. phenylcyanide

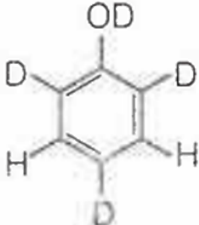
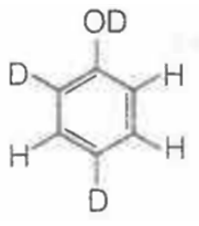
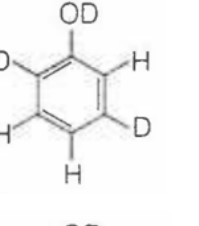
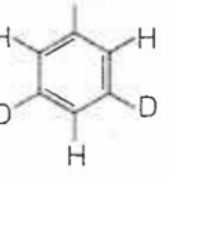
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- C. phenylcyanate
D. phenylisocyanate

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Answer

60. When phenol is treated with D_2SO_4 / D_2O , some of the hydrogens get exchanged. The final product in this exchange reaction is

- A. 
- B. 
- C. 
- D. 

Answer