CHEMISTRY

BOOKS - G.R. BATHLA & SONS

CHEMISTRY (HINGLISH)

ADSORPTION AND CATALYSIS

Practice Problems

1. Show that the maximum enzyme catalysed reaction rate will occur for

$$[H^+]_{opt} = \sqrt{k_1 k_2}$$

The general pH control enzyme catalysed reaction is

$$EH_2^{2+} \Leftrightarrow EH^+ \Leftrightarrow E$$

Only EH^+ is capable for binding substrate and catalysing the desired reaction,

$$k_1 = \frac{[EH^+][H^+]}{[EH_2^{2+}]}, k_2 = \frac{[E][H(+)]}{[EH^+]}$$

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2. The rate of decomposition of acetaldehyde into methane and CO in the presence of I_2 at

800 K follows the rate law:

Rate $= k[CH_3CHO][I_2]$

The decomposition is believed to go by a two step mechanism:

$$CH_3CHO + I_2 \rightarrow CH_3I + HI + CO$$

$$CH_3I + HI \rightarrow CH_4 + I_2$$

What is the catalyst for the reaction ? Which of the two steps is a slower one ?

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3. A solution of palmitic acid (M=256) in benzene contains 4.24 g acid per litre. When this solution is dropped on the water surface, benzene evaporates and palmitic acid forms monomolecular film of the solid type. If we wish to cover an area of 500 cm^2 with a monolayer, what volume of solution should be used ? The area occupied by one palmitic acid molecule may be taken to be $21 \times 10^{-20} m^2$

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4. Give the mechanism of the following reactions:

(a) In lead chamber process, NO(g) is used as catalyst in the oxidation of SO_2 to SO_3.

(b) NO(g) catalyses the decomposition ozone to oxygen.

(c) Ozone layer depletion by freon or teflon.

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5. One gram of charcoal adsorbs 100 mL of 0.5 MCH_3COOH to form a mono-layer and

thereby the molarity of acetic acid is reduced to 0.49 M. Calculate the surface area of the charcoal adsorbed by each molecule of acetic acid. Surface acid of charcoal $= 3.01 \times 10^2 m^2 / gm$

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Objective Questions Level A

1. Adsorption is the phenomenon in which a substance :

A. accumulates on the surface of the other substance

B. goes into the body of the other substance

C. remains close to the other substance

D. oxidises or reduces the other substance

Answer: A

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2. Physical adsorption is appreciable at.....temperature,

A. higher temperature

B. lower temperature

C. room temperature

D. $100^0 C$

Answer: B

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3. The rate of chemisorption :

A. decreases with increase of temperature

B. is independent of pressure

C. is maximum at one room atmosphere pressure

D. increases with increase of pressure

Answer: D

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4. In the adsorption of oxalic acid on activated charcoal, the activated charcoal is called

A. absorber

B. adsorbate

C. adsorbent

D. absorbate

Answer: C

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5. Which of the following is not a characteristic of chemisorption?

A. adsorption is irreversible

B. ΔH is of the order of 400 KJ

C. adsorbtion is specific

D. adsorption increases with increase of surface area

Answer: B

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6. Which of the following is/are application(s) of adsorption?

A. De-ionisation of water

B. Gas marks

C. Hygroscopic nature of $CaCl_2$

D. Heterogenous catalysis

Answer: C

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7. Which one of the following is not a correct statement ?

A. Physical adsorption is reversible in nature

B. Physical adsorption involves van der waals'forces

C. Rate of physical adsorption increases with increases of pressure on the adsorbate

D. High activation energy in involved

Answer: D

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8. Which of the following is the correct statement ?

A. chemisorption is reversible in nature

B. chemisorption is high at low temperature

C. chemisorption depends on the nature of gas

D. chemisorption does not involve activation energy

Answer: C

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9. A catalyst is a substance which

A. increase the equlibrium concentration of the product

B. changes the equlibrium constant of the reaction

C. shortens the time to reach equlibrium

D. supplies energy to the reaction

Answer: C

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10. A catalyst

A. increase the free energy change in the reaction

B. decreases the free energy change in the reaction

C. does not increase or decrease the free energy change in the reaction

D. can either decrease or increase the free energy change depending on what

catalyst we use

Answer: C

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11. Which of the following statements is more correct ?

A. A catalyst only accelerates the rate of chemical reaction

B. A catalyst can retard the rate of a chemical reaction

C. A catalyst can control the speed of the reaction

D. A catalyst alters the speed of the reaction

Answer: D

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12. A catalysts is a substance which :

A. increase the equlibrium constant of the reaction

B. increases the eulibrium concentration of products

C. does not alters the reaction mechanis

D. changes the activation energy of te reaction

Answer: D

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13. Which of the following reactions is an examples of homogeneous catalysis ?

A. $2H_2O_2(l) \xrightarrow{MnO_2(s)} 2H_2O(l) + O_2(g)$

B. $2SO_2(g) + O_2(g) \xrightarrow{V_2O_5(s)} 2SO_3(g)$

C. $2CO(g) + O_2(g) \xrightarrow{NO(g)} 2CO_2(g)$

D. $H_2(g) + C_2H_4(g) \xrightarrow{Ni(s)} C_2H_6(g)$

Answer: C

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14. The substance which decreases the rate of a chemical reaction is called :

A. inhibitor

B. poison

C. moderator

D. promotor

Answer: A

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15. The decomposition of hydrogen peroxide can be slowed by the addition of a small amount of acetamide. The latter acts as a

A. inhibitor

B. promotor

C. moderator

D. poison

Answer: A

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16. The temperature at which the catalystic activity of the catalysts is maximum ,is called

A. critical temperature

B. room temperature

C. absolute temperature

D. optimum temperature

Answer: D

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17. Efficiency of the catalysts depends on its :

A. molecular weight

B. number of free vallency

C. physical state

D. amount used

Answer: B

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18. Which of the following types of metal form the most efficient catalysts?

A. transition metals

B. Alkali metals

C. Alkaline earth metals

D. Radioactive metals

Answer: A

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19. Enzymes are made up of

A. edible protein

B. protiens with specific structure

C. nitrogen containing carbohydrates

D. carbohydrates

Answer: B

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20. In lead chambe process , which one of the following oxides is used as a catalysts ?

A. NO

B. NO_2

C. N_2O_3

D. N_2O_5

Answer: A

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21. Glucose or fructose is converted into C_2H_5OH in the presence of ?

A. invertase

B. diastase

C. maltase

D. zymase

Answer: D

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22. The name catalysis was given by :

A. Rutherford

B. Langmuir

C. Graham

D. Berzelius

Answer: D

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23. In the reaction $KMnO_4 + H_2SO_4 + H_2C_2O_4 \rightarrow$ products, Mn^{2+} ions act as:

A. positive catalysts

B. negative catalyst

C. autocatalyst

D. enzyme catalyst

Answer: C

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24. In the Haber process of synthesis of NH_3 :

A. Mo acts as a catalyst and Fe as a promotor

B. Fe acts as a catalysts and Mo as a promotor

C. Fe acts as inhibitor and Mo as a promotor

D. Fe acts as promotor and Mo as autocatalyst

Answer: B

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25. TEL, tetraethyl lead, acts as antiknocking agent. It acts as..... catalyst.

A. positive catalysts

B. negative catalyst

C. autocatalyst

D. induced catalyst

Answer: B

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26. Edges and peaks are more effective in a catalyst because :

A. they have more free valancies

B. they have limited numbers of atoms

C. they have limited number of molecules

D. none of above

Answer: A

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27. An enzyme which brings about the conversion of starch into maltose is known as

A. maltase

B. zymase

C. invertase

D. diastase

Answer: D

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28. Which of the following statements is incorrect ?

A. Enzymes exist in colloidal state

B. Enzymes are catalysts

C. Enzymes can catalyse any reaction

D. urease is an enzyme

Answer: C

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29. Wh ich of the following catalysts is used in Friedel -Crafts reaction for preparation of toluene from benzene ?

A. Anhydrous aluminium chloride

B. Nickel

C. Platinium

D. Palladium

Answer: A

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30. Platinised asbestos is used as a catalyst in the manufacture of H_2SO_4.It is an example of :

A. homogenous catalyst

B. hetrogenous catalyst

C. autocatalyst

D. induced catalyst

Answer: B

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31. The catalyst used in the manufacture of H_2SO_4 by contact process is

A. Al_2O_3

B. Cr_2O_3

C. V_2O_5

D. MnO_2

Answer: C

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32. The formation of diethyl ether from ethanol is catalysed by :

A. H_2SO_4

B. Al_2O_3

C. Cu

D. Ni

Answer: A

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33. Which of the following catalysts is sensitive to temperature changes ?

A. Fe

B. Pt

C. nitrogen containing carbohydrates

D. Enzyme

Answer: D

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34. The catalyst used in the Deacon's process for the manufacture of chlorine is

A. Pt

B. $CuCl_2$

C. V_2O_5

D. Fe

Answer: B

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35. A catalytic poison renders the catalyst ineffective beacause :

A. it is prefertially absorbed on the catlyst

B. it adsorbs the molecules of the reactants

C. it combines chemically with the catalyst

D. it combines with one of the reactants

Answer: A

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36. A finely divided state of the catalyst is more efficient because in this state :

A. more surface area is available

B. more energy is stored in the catalyst

C. positive charge is acquired

D. negative charges is acquired

Answer: A

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37. Which of the following statement is not true?

A. The action of a catalyst is specific

B. The catalyst does not alter the equilibrium

C. A small amount of catalyst is sufficient to catalyst large amount of reactants

D. The catalyst initiates the reaction

Answer: D

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38. The catalyst used in the manufacture of hydrogen by Bosch's process is :

A. Fe_2O_3

B. Cr_2O_3

C. $Fe_2O_3 + Cr_2O_3$

D. Cu

Answer: C

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39. The catalyst used for olefin polymerisation is

A. Ziegler-Natta catalyst

B. Wilkinson's catalyst

C. Raney nickel catalyst

D. Merifield resin

Answer: A

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40. According to the adsorption theory of catalysis the speed of the reaction increases because

A. adsorption produces heat which increases the rate of reaction

B. in the process of adsorption , the kinetic energy of the molecules increases

C. the concentration of reactants at the active centres becomes high due to adsorptiomn

D. the activation energy of the reaction becomes high due to adsorption

Answer: C

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41. Which of the following statement is false ?

A. Enzymes are highly specific

B. Enzymes increase activation energy

C. Enzymes require optimum temperature

D. Enzyme require optimum Ph

Answer: B

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42. An example of autocatalytic reaction is

A. hydrogenation of oils

B. decomposition of nitroglycerine

C. oxidation of Na_3AsO_3 in the presence of Na_2SO_3

D. thermal decomption of $KClO_3$ in the presence of MnO_2

Answer: B

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43. Enzyme catalysis is an example of :

A. autocatalysis

B. hetrogeneous catalysts

C. homogenous catalysis

D. induced catalyst

Answer: B

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44. Which one of the following statements is incorrect in the case of hetrogeneous catalyst ?

A. The catalyst lower the energy of activation

B. The catalyst actually forms a compound with the reactant

C. The surface of the catalyst plays a very important role

D. There is no change in the energy of activation

Answer: D

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45. Regarding criteria of catalysis which one of the following statements is not true ?

A. The catalyst is unchanged chemically during the reaction

B. A small quantity of catalyst is often sufficient to bring about a considerable amount of the reaction

C. In reversible reaction ,the catalyst alters the equilibrium position

D. The catalyst accelerates the rate of reaction

Answer: C

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46. In which of the following process, a catalyst is not used ?

A. Haber's process

B. Deacon's process

C. Solvay process

D. Lead chamber process

Answer: C

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47. The effect of a catalyst in a chemical reaction is to change the :

A. activation energy

B. equilibrium concentration

C. heat of reaction

D. final products

Answer: A

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48. Protons accelerate the hydrolysis of esters . This is an example os :

A. a promotor

B. a hetrogeneous catalyst

C. an acid -base Catalyst

D. an autocatalyst

Answer: C

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49. in the Ostwald's process for the manufacture of HNO_3, the catalyst used is

A. Fe

B. Pt

C. V_2O_5

D. Mo

Answer: B

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50. The effieciency of an enzyme in catalysing a reaction is due to its capacity

A. to form a strong enzyme substrate complex

B. to decrease the bond energies in the substrate molecules

C. to change the shape of the substrate molecule

D. to lower the activation of the reaction

Answer: D

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51. The enzyme are killed :

A. at a very high temperature

B. diuring the chemical reaction

C. at low temperature

D. under atmospheric pressure

Answer: A

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52. The enzyme ptylin used for digestion of food is present in :

A. saliva

B. blood

C. intestine

D. adrenal glands

Answer: A

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53. Which of the following acts as a negative catalysts ?

A. Lead tetraethyl as antiknock compound

B. Glycerol in the decomposition of H_2O_2

C. Ethanol in the oxidation of chloroform

D. All of above

Answer: D

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54. Which of the following types of metal form the most efficient catalysts?

A. Alkali metals

B. Transition metals

C. Alkaline earth metals

D. Radioactive metals

Answer: B

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55. Which is not the characteristic of a catalyst ?

A. it changes the equilibrium point

B. it initiates the reaction

C. it alter the rate of reaction

D. it increases the average KE of molecules

Answer: B

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56. In chemical reaction , the catalyst :

A. alters the amount of products

B. lower the activation of energy

C. decreases ΔH of forward reaction

D. increases ΔH of forward reaction

Answer: B

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57. Which statements is not correct ?

A. Physical adsorption is due to Vander Waal's forces

B. Physical adsorption decreases at high temperature and low pressure

C. Physical adsorption is reversible

D. Adsorption energy for chemical adsorption is generally lesser than that for physical adsorption

Answer: D

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58. In the adsorption of oxalic acid on activated charcoal, the activated charcoal is called

A. adsorbent

B. adsorbate

C. adsorber

D. none of above

Answer: A

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59. Which can absorb large volume of hydrogen gas ?

A. Colloidal solution of palladium

B. Finely divided nickel

C. Finely divided platinum

D. Collodial $Fe(OH)_3$

Answer: A

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60. In which of the following processes, platinum is used as a catalyst

A. oxidation of ammonia to form nitric acid

B. hardining of oils

C. production of synthetic rubber

D. synthesis of methanol

Answer: A

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61. When $KClO_3$ is heated, it decomposes into $KCl + O_2$, if some MnO_2 is added, the reaction goes much faster because.

A. MnO_2 decomposes to give oxygen

B. MnO_2 providing heat by reacting

C. better contact is provided byMnO_2

D. MnO_2 acts as catalyst

Answer: D

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62. Which acts as poison for Pd-charcoal in Lindlar catalyst ?

A. $BaSO_4$

B. Quinoline

C. Both (a) and (b)

D. none of above

Answer: C

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63. The inhibitors :

A. retard the rate of a chemical reaction

B. stop a chemical reaction immediately

C. are reducing agents

D. donot allow the reaction to proceed

Answer: A

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64. in the Ostwald's process for the manufacture of HNO_3, the catalyst used is

A. Mo acts as a catalyst and Fe as a promotor

B. Pt

C. V_2O_5

D. Fe

Answer: B

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65. Which is an example of autocatalyst ?

A. Hydrolysis of methyl acatate

B. Decomposition of TNG

C. Oxidation of oxalic acid by $KMnO_4$

D. All of above

Answer: D

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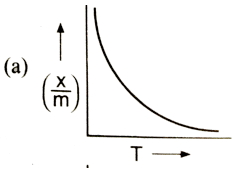
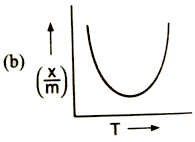
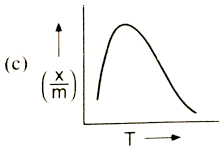
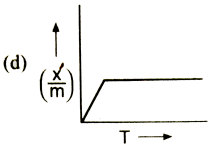
66. Which plot is the adsorption isobar for chemisorption?

A. 

B. 

C. 

D. 

Answer: C

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67. In the titration between oxalic acid and acidified potassium permanganate ,the manganous salt formed during the reaction and catalysis the reaction .The manganous salts acts as :

A. promotor

B. positive catalyst

C. autocatalyst

D. none of above

Answer: C

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68. Adsorption is accompanied by :

A. decrease in entrpy of the system

B. decrease in enthalpy of the system

C. $T\Delta S$ for the process is negative

D. All of above

Answer: D

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69. Considered the following statements :

1. Zeolites are aluminosilicates

2. Aluminium can occupy two adjacent sides in zeolites.

Which of the following statements is correct ?

A. 1 only

B. 2 only

C. both 1 and 2

D. neither 1 and 2

Answer: A

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70. Zeolites are used as catalyst in :

A. petrochemical industries during cracking

B. the preparation of H_2SO_4

C. The hydrolysis of water

D. All of above

Answer: A

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71. Choose the correct statements for chemical adsorption :

A. Value of adsorption enthalpy in above -20KJ mol^{-1}

B. Van der waal's forces exist between adsorbent and adsorbate

C. Usually monomolecular layer is formed on adsorbent

D. Multimolecular layer may be formed on adsorbent

Answer: C

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72. the fucntion of zymase is to :

A. change starch into sugar

B. ferment glucose to alcohol and carbon dioxide

C. change malt sugar into glucose

D. change starch into malt sugar and dextrin

Answer: B

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73. Which of the following relations is /are correct?

(i) $x/m =$ constant (at high pressure)

(ii) $x/m =$ constant $\times P^{1/n}$ (at intermediate pressure)

(iii) $x/m =$ constant $\times P^{n}$ (at low pressure)

A. All are correct

B. All are wrong

C. (i) and (ii) are correct

D. (iii) is correct

Answer: C

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74. The principle involved in the chromatographic operation is :

A. adsorption

B. absorption

C. partition

D. none of above

Answer: A

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75. The function of enzymes in the living system is to:

A. transport oxygen

B. provide immunity

C. catalyse biochemical reaction

D. provide energy

Answer: C

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76. Which of the following is a shape selective cataltst ?

A. V_2O_5

B. Cr_2O_3

C. Hydrated zeolites

D. ZSM-5

Answer: D

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77. the process whichh is catalysed by one of the product is called

A. acid-base catalyst

B. autocatalyst

C. negative catalyst

D. positive catalyst

Answer: B

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78. the heat evolved in physisorption lies in the range (in kJ/mol) of :

A. 20-40

B. 40-100

C. 100-200

D. 200-400

Answer: C

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79. In physical adsorption, the forces associated are :

A. ionic

B. covalent

C. van der waals

D. H-bonding

Answer: C

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80. In Ziegler-Natta polymerisation of ehtylene , the active species are :

A. $AlCl_3$

B. EtA

C. Ch_2CH_2

D. Ti^{3+}

Answer: D

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81. $ZSM-5$ is used to conver :

A. alcohol to petrol

B. benzene to toluene

C. toluene to benzene

D. heptane to toluene

Answer: A

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82. A catalyst increases rate of reaction by

A. decreasing enthalpy

B. decreasing internal energy

C. decreaseing activation energy

D. increasing activation energy

Answer: C

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83. The role of a catalyst in a reversble reaction is to

A. increase the rate of forward reaction

B. decrease the rate of backward reaction

C. alter the equilibrium constant of a reaction

D. allow the equilibrium to be achieved quickly

Answer: D

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84. A catalyst in a reversible reaction is to :

A. it has got large activation energy

B. it can react with one reactant more effectively

C. it has large surface area

D. all of the above

Answer: C

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85. Which of the following is/are not possible in case of autocatalysis?

A. reactant catalyses

B. heat produced in the reaction catalyses

C. product catalyses

D. solvent catalyses

Answer: C

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86. Which of the following statements is false ?

A. increase in pressure may increase the amount of adsorption

B. increase of temperature may decrease the amount of adsorption

C. the adsorption may be monolayered or multilayered

D. particle size of the adsorbent will not affect the amount of adsorption

Answer: D

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87. The rate of physisorption increases with

A. decrease in temperature

B. increase in temperature

C. decrease in pressure

D. decrease in surface area

Answer: A

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88. Which is not correct for physical adsorption?

A. Adsorption increases with increase in temperature

B. Adsorption is spontaneous

C. Both enthalpy and entropy of adsorption are negative

D. Adsorption on solid is reversible

Answer: A

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89. According to the adsorption theory of catalysis the speed of the reaction increases because

A. the concntration of the reactant molecules at the active centres of catalyst becomes high due to adsorption

B. in the process of adsorption ,the activation energy of the molecules become large

C. adsorption produces heat which increases the speed of the reaction

D. adsorption lowers the activation energy of the reaction

Answer: A

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90. The chemical equlibrium of a reversible reaction is not influenced by :

A. Catalyst

B. Pressure

C. Temperature

D. Concentration

Answer: A

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91. Identify the gas which is readily adsorbed by activated charcoal?

A. N_2

B. H_2

C. O_2

D. SO_2

Answer: D

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92. Which of the following belong(s) to the family of enzymes?

A. lipase

B. pepsin

C. ptylin

D. cellulose

Answer: D

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93. Which statement about zeolite is false ?

A. They are used as cation exchanger

B. They have open structure which enables them to take up small molecules

C. Zeolitea are aluminosilicates having a three dimensional network

D. Some of the SiO_4^{4-} units are replaced by $AlO_4(5-)$ and AlO_6^{9-} ions in zeolites

Answer: D

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94. Adsorpton of gases on solid surface is generally exothermic because :

A. nthalpy is positive

B. entropy decreases

C. entropy increases

D. free energy increases

Answer: B

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95. Identify the correct statement regarding enzymes.

A. Enzymes are specific biological catalysts that can normally function at very high temperature

B. Enzymes are normally hetrogeneous catalyst that are specific in action

C. Enzymes are specific biological catalysts that cannot be poisoned

D. Enzymes are specific bological catalysts that posses well defined active site

Answer: B

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96. The extent of adsorption of a gas on a solid depends on the :

A. nature of gas

B. pressure of the gas

C. temperature of the gas

D. all are correct

Answer: D

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97. Which of the following is true in respect of chemical adsorption?

A. $\Delta G < 0, \Delta S > 0, \Delta H < 0$

B. $\Delta G < 0, \Delta S < 0, \Delta H < 0$

C. $\Delta G > 0, \Delta S > 0, \Delta H < 0$

D. $\Delta G > 0, \Delta S > 0, \Delta H > 0$

Answer: B

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98. If x/m is the mass of adsorbate adsorbed per unit mass of adsorbent, P is the pressure of the adsorbate gas ,a and b are constant ,which of the following represent "Langmuir adsorption isotherm"?

A. $\log\left(\frac{x}{m}\right) = \log\left(\frac{a}{b}\right) + \frac{1}{a}\log P$

B. $\frac{x}{m} = \frac{b}{a} + \frac{1}{aP}$

C. $\frac{m}{x} = \frac{1+bP}{aP}$

D. $\frac{1}{(x/m)} = \frac{a}{b} + \frac{P}{a}$

Answer: C

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99. The efficiency of an enzyme to catalyse a reacrtion is due to its capacity to:

A. reduce the activation energy of the reaction

B. form strong enzyme-substrate molecules

C. decrease the bond energy of the catalyst -substrate reaction

D. alter the substrate geometry to fit into the shape of the enzyme molecules

Answer: A

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100. Although nitrogen does not adsorb on surface at room temperature, it adsorbs on

the same surface at $83K$. Which one of the following statements is correct?

A. At 83 K ,there is formation of monomolecular layer

B. At 83 K ,there is formation of multimolecular layers.

C. At 83 K, nitrogen molecules are held by chemical bonds.

D. At 83 K,nitrogen is adsorbed as atoms

Answer: B

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101. What is the equation form of Langmuir adsorption isotherm undre high pressure?

A. $\frac{x}{m} = \frac{a}{b}$

B. $\frac{x}{m} = ap$

C. $\frac{x}{m} = \frac{1}{aP}$

D. $\frac{x}{m} = \frac{b}{a}$

Answer: A

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102. What is an adsorption isotherm? Describe Freundlich adsorption isotherm.

A. $\frac{x}{m} = KP^{1/n}$

B. $x = mKP^{1/n}$

C. $\frac{x}{m} = KP^{-n}$

D. all of these

Answer: D

Watch Video Solution

103. Which of the following statements is incorrect regarding physisorption?

A. It occurs because of van der waal's forces

B. more easily liquifiable gases are adsorbed readily

C. under high pressure it results into multimolecular layer on adsorbent surface

D. Enthalpy of adsorption $(\Delta H_{\text{adsorption}})$ is low and positive

Answer: D

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104. Active charcoal is a good catalyst because :

A. it is made up of carbon atoms

B. it is very reactive

C. it has more adsorption power

D. it has inert nature towards reagent

Answer: C

 Watch Video Solution

105. According to the adsorption theory of catalysis the speed of the reaction increases because

A. adsorption produces heat which increases the rate of reaction

B. adsorption lowers the activation energy of the reaction

C. the concentration of reactants molecules at the active centres of the catalyst becomes high due to adsorption

D. in the process of adsorption ,the activation energy of the molecules becomes large

Answer: B

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106. The Langmuir adsorption isotherm is deduced using the assumption.

A. the adsorption sites are equivalent in their ability to adsorb the particles

B. the heat of adsorption vaies with coverage

C. the adsorbed molecules interact with each other

D. the adsorption take place in multilayers

Answer: A

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107. The efficiency of an enzyme to catalyse a reacrtion is due to its capacity to:

A. form a strong enzyme-substrate complex

B. change the shape of the substrate

C. lower the activation energy of the reaction

D. form a colloidal solution in water

Answer: C

Watch Video Solution

108. Activated charcoal is used to remove colouring matter from pure substance, it works by

A. absorption

B. adsorption

C. adsorption and absorption

D. none of above

Answer: B

Watch Video Solution

109. According to Freundlich adsorption isotherm, which of the following is correct?

A. $\frac{x}{m} \propto P^{\circ}$

B. $\frac{x}{m} \propto P^{1}$

C. $\frac{x}{m} \propto P^{1/n}$

D. All of the above are correct for different ranges of pressure

Answer: D

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110. $3g$ of actived chacoal was added to 50mL of acetic acid solution $(0.06N)$ in a flask. After an hour it was filterred and the strength of the filtrate was found to be $0.042N$. The amount of acetic adsorbed (per gram of charcoal) is:

A. 54 mg

B. 18 mg

C. 36 mg

D. 42 mg

Answer: B

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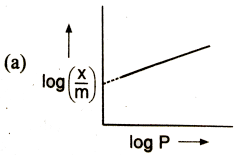
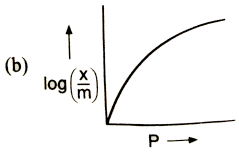
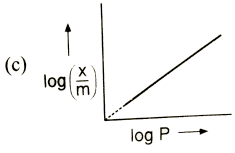
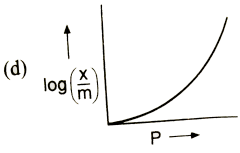
111. Which of the following curves is in accordance with freundlich adsorption isotherm?

A. 

B. 

C. 

D. 

Answer: A

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112. For a linear plot of log (x/m) versus log [in a Freundlich adsorption isotherm, which of the following statements is correct ? (k and n are consists)

A. both K and 1/n appears in the slope term

B. 1/n appears as the intercept

C. only 1/n appears as the slope

D. log(1/n) ppears as the intercept

Answer: C

Watch Video Solution

113. Which of the following statements is incorrect regarding physisorption?

A. The forces involved are Van der waal's forces

B. more easily liquifiable gases are adsorbed readily

C. under high pressure it results into multimolecular layer on adsorbent surface

D. $\Delta H_{\text{adsorption}}$ is low and positive

Answer: D

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114. Reactions in zeolites catalyst depends on :

A. pores

B. apertures

C. size of cavity

D. all of above

Answer: D

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115. Which is not the correct statement in respect of chemisorption ?

A. Highly specific adsorption

B. Irreversible adsorption

C. Multilayered adsorption

D. Highly enthalpy of adsorption

Answer: C

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116. Which of the following is not a favourable condition for physical adsorption?

A. high temperature

B. high pressure

C. higher critical temperature of adsorbate

D. low temperature

Answer: A

Watch Video Solution

117. Hydrogenation of vegeyable oils in presence of finely divided Nickel as catalyst. The rection is :

A. hetrogeneous catalysis

B. homogeneous catalysis

C. enzyme catalysed reaction

D. liquid catalysed reaction

Answer: A

 Watch Video Solution

118. Which of the following is present in gas mask ?

A. Silica gel

B. V_2O_5

C. Activated charcoal

D. Fluorescein

Answer: A

Watch Video Solution

119. Which one of the following statement is correct ?

A. The differene in the initial and final concentrations of the adsorbate gives the value of 'x' in Freundlich equation (x=mass of adsorbate)

B. The mass of adsorbent gives the value of 'n' in Freundlich equation

C. Chemisorption decreases with increase in the surface area of the adsorbent

D. Enthalpy of adsorption is 20 KJ/mol^{-1} in chemisorption

Answer: A

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Objective Questions Level B

1. In the presence of a catalyst, the activation energy is lowered by 3 Kcal at 27°c .Hence the rate of reaction will increase by :

A. 32 times

B. 243 times

C. 2 times

D. 148 times

Answer: D

Watch Video Solution

2. According to the adsorption theory of catalysis the speed of the reaction increases because

A. adsorption lowers the activation energy of the reaction

B. concentration of reactant molecules at the active centres of the catalyst becomes high bue to adsorption

C. adsorption produces heat which increases the rate of reaction

D. adsorption increases the activation energy of the reaction

Answer: B

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3. Which is not correct for physical adsorption ?

A. Adsorption is spontaneous

B. ΔH and ΔS are negative

C. it is reversible in nature

D. Degree of adsorption increass with temperature

Answer: D

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4. Freundlich adsorption isotherm gives a straight line on plotting :

A. $\frac{x}{m}$ vs P

B. $\log \frac{x}{m}$ vs P

C. $\log \frac{x}{m}$ vs log P

D. $\frac{x}{m}$ vs $\frac{1}{P}$

Answer: C

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5. The incorrect statement pertaining to the adsorption of a gas on a solid surface is :

A. Adsorption is always exothermic

B. Physisorption may transform into chemisorption at high temperature

C. Physisorption increases with increasing temperature but chemisorption decreases with increasing temperature

D. Chemisorption is more exothermic than physisorption ,however, it is very slow due to higher energy of activation

Answer: C

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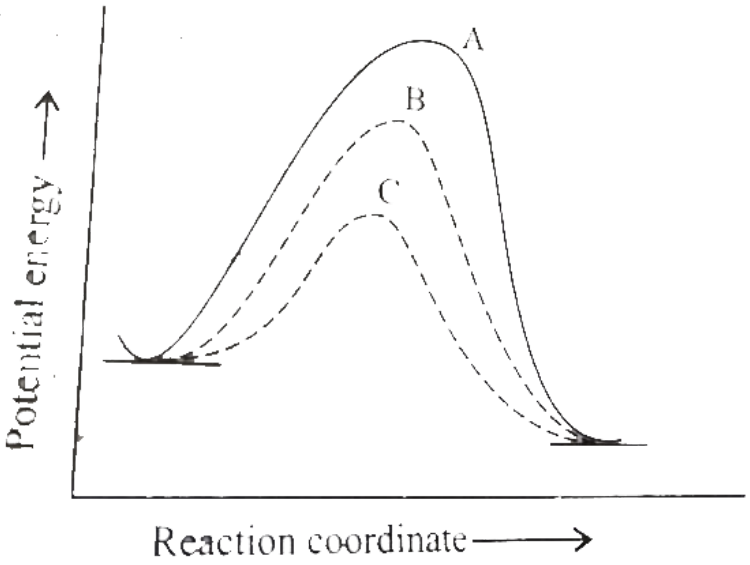
6. Substances which alter the velocity of a reaction by mere presence, without undergoing any change in mass and compossition are termed catalyst and the phenomenon is known as catalysis

In homogenous catalytic reactions, there are three alternative paths A, B, and C (shown in figure). Which one of the following indicates the relative ease with which the reaction can

take place?



A. $A > B > C$

B. $C > B > A$

C. $B > C > A$

D. A =B=C

Answer: B

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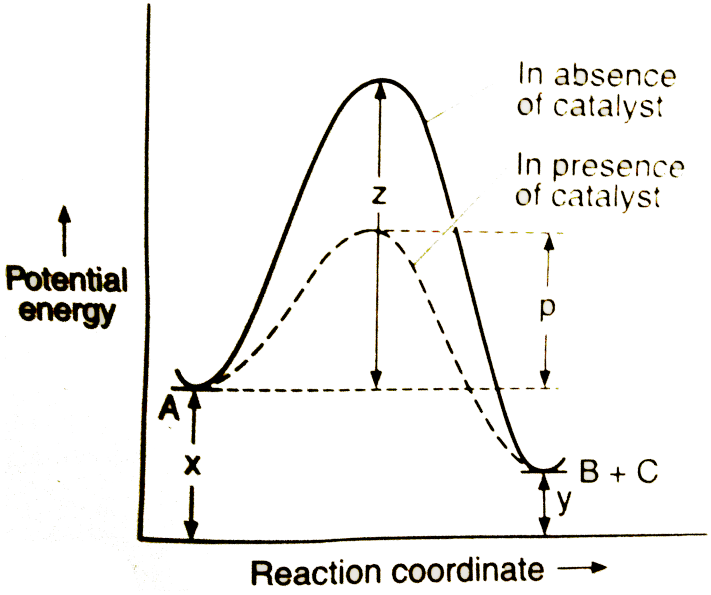
7. For the reaction $(A \rightarrow B + C)$, the energy profile diagram is given in the figure .



A. z

B. z - p

C. y - z

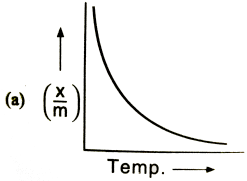
D. z - x

Answer: B

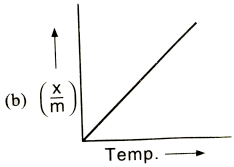
View Text Solution

8. Following is the variation of physical adsorption with temperature.

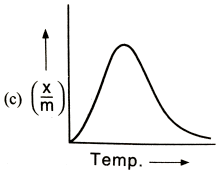
A.



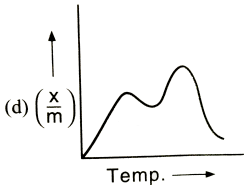
B.



C.



D.



Answer: A

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9. The colloidal system consisting of a liquid adsorbete in a solid adsorbent is termed as:

A. aerosol

B. foam

C. emulsion

D. gel

Answer: D

Watch Video Solution

10. Which can adsorbe large volume of hydrogen gas ?

A. Colloidal solution of palladium

B. Finely divided nickel

C. Finely divided platinum

D. Collodial $Fe(OH)_3$

Answer: A

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11. Which is false for catalyst ?

A. A catalyst can initiate a reaction

B. It does not alter the position of equilibrium in a reversible reaction

C. A catalyst remains unchanged in quality and composition at the end of reaction

D. Catalysts are sometimes very specific in reaction

Answer: A

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12. The curveshowing the variation of pressure with temperature for a given amount of adsorption is called :

A. adsorption isobar

B. adsorption isotherm

C. adsorption isotere

D. adsorption isochore

Answer: C

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13. Which of the following statements is incorrect ?

A. Adsorption always leads to a decrease in enthalpy and entropy of the system.

B. Adsorption arises due to unsaturation of valence forces of atoms or molecules on the surface .

C. Adsorption increases with rise in temperature

D. Adsorption decreases the surface energy.

Answer: C

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14. Adsorption is the tendency of accumulation of molecular species at the surface of solid or liquid. Depending upon the

nature of bonds or forces of attraction between adsorbate and adsorbent. It is classified between physisorption and chemisorption.

Which of the following gas molecules have maximum value enthalpy of physisorption?

A. C_2H_6

B. Ne

C. H_2O

D. H_2

Answer: C

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15. Adsorption is the tendency of accumulation of molecular species at the surface of solid or liquid. Depending upon the nature of bonds or forces of attraction between adsorbate and adsorbent. It is classified between physisorption and chemisorption.

Which of the following gases is adsorbed most by activated charcoal?

A. CO_2

B. N_2

C. CH_4

D. H_2

Answer: A

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16. Which of the following factors are responsible for the increase in the rate of a surface catalysed reaction ?

(I) A catalyst provides proper orientation for

the reactant molecules

(II) Heat of adsorption of reactants on a catalyst helps reactant molecules to overcome activation energy

(III) The catalyst increases the activation energy of the reaction

(IV) Adsorption increases the local concentration of reactant molecules on the surface of the catalyst.

Select the correct answer using the codes given below:

A. I and II

B. I and III

C. II and IV

D. I,II and IV

Answer:

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17. In Langumir's model of adosrption of a gas on a solid surface :

A. the rate of dissociation of adsorbed molecules from the surface does not depend on the surface covered

B. the adsorption at a single site on the surface may involve multiple molecules at the same times

C. the mass of gas striking a given area of surface is proportional to the pressure of the gas

D. the mass of gas striking a given area of surface is independent of the pressure of a gas

Answer: C

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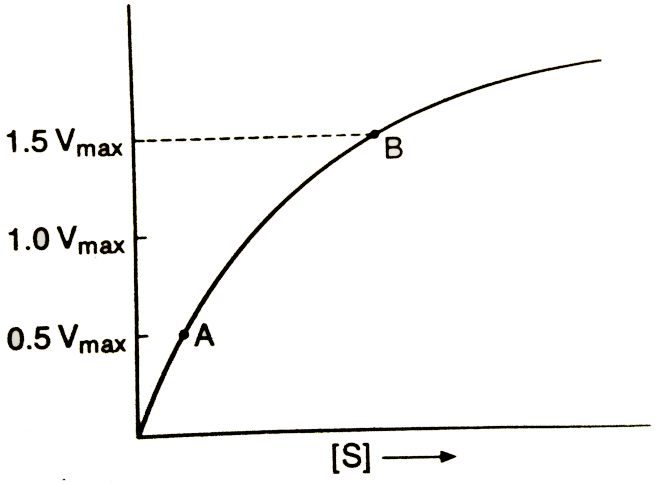
18. An enzyme [E] is combined with the substrate [S] as follows:

$$E + S \underset{K_{-1}}{\overset{K_1}{\Longleftrightarrow}} ES$$

$$ES \xrightarrow{K_2} P + E$$

The overall reaction rate is given by:

Rate $= \dfrac{V_{\max}[S]}{K_m + [S]}$ and the rate of reaction varies with substrate concentration as:



The order of reaction at point A is :

A. 1

B. 2

C. 0

D. 3

Answer: A

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19. Which type of graph gives straight line in Langmuir adsorption isotherm ?

A. $\frac{x}{m} \rightarrow \frac{1}{P}$

B. $\frac{m}{x} \rightarrow \frac{1}{P}$

C. $\log\left(\frac{x}{P}\right) \rightarrow \frac{1}{P}$

D. $\log\left(\frac{x}{m}\right) \rightarrow P$

Answer: B

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20. Plot of log against log P is a straight line inclined at an angle of 45°. When the pressure is 0.5 atm and Freundlich parameter ,K is 10, the amount of solute adsorbed per gram of adsorbent will be : (log 5=0.6990)

A. 1 g

B. 2 g

C. 3 g

D. 5 g

Answer: D

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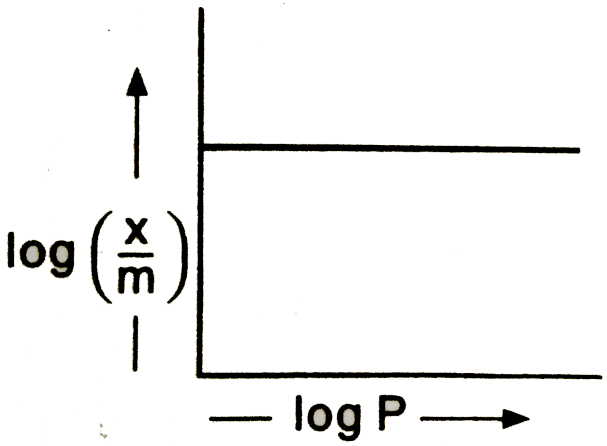
21. Following graphs will be true when :



A. P = 0

B. P = 1

C. $\frac{1}{n} = 0$

D. $\frac{1}{n} = \infty$

Answer: C

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22. Methylene blue, from its aqueous solution, is adsorbed on activated charcoal at $25^{\circ}C$. For process, the correct statement is

A. The adsorption requires activation at 25^{0}C.

B. The adsorption is accompained by a decrease in enthalpy

C. The adsorption increases with increase in temperature

D. The adsorption is irreversible

Answer: B

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23. Zeolites are microporous catalyst. General formula of Zeolite may be given as :

A. $M_{x/n}\left[(AlO_2)_x(SiO_2)_y\right].mH_2O$

B. $M\left[(AlO_2)_x . mH_2O\right.$

C. $M_x\left[(AlO_2)_x(SiO_2)_y\right]$

D. $M_x\left[(SiO_2)_y\right] . mH_2O$

Answer: A

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24. Which of the following statements are correct ?

A. Physical adsorption is of multimolecular layer

B. Degree of chemical adsorption increases with increase in temperature

C. Adsorption increases the surface energy

D. Sometimes solvent is adsorbed in preference to solute

Answer: A::B::D

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25. Which of the following are Zeolites ?

A. Granite

B. Faujasite

C. Natrolite

D. Thomisite

Answer: B::C::D

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26. Which of the following act as negative catalyst ?

A. Ehtanol in oxidation of chloroform

B. Tetraethyl lead used as antiknocking agent

C. Glycerol in the decomposition of H_2O_2

D. Fe in the formation of ammonia by Haber process

Answer: A::B::C

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27. Select the correct statements about enzymes :

A. Enzymes are biological catalysts found in organisms

B. All enzymes are protiens

C. Enzymes can catalyse any reaction

D. Enzyme's activity is optimum at 27° C.

Answer: A::B::D

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28. Which of the following are correct about the catalyst ?

A. They participate in the reaction but recovered at last

B. It does not affect ΔG

C. It does not affect the ΔH

D. It alters the mechanism of reaction

Answer: A::B::C::D

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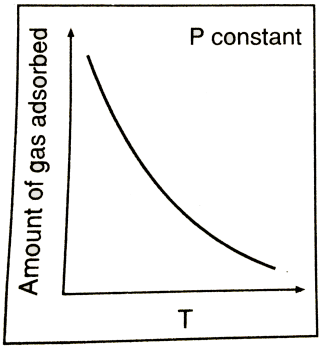
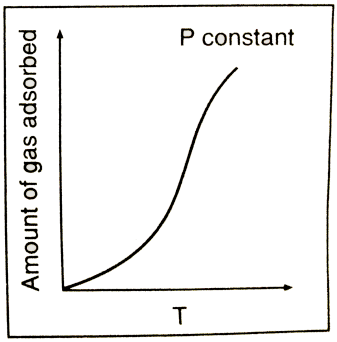
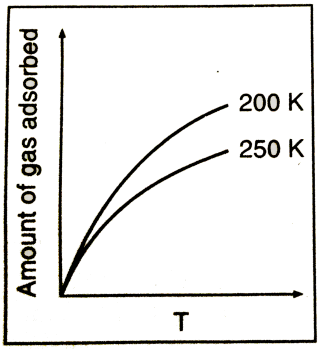
29. The given graph/data I,II,III and IV represent general trends observed for different physisorption and chemisorption processes under mild conditions of temperature and pressure . Which of the following choice(s) about I,II,III, and IV is/are correct ?



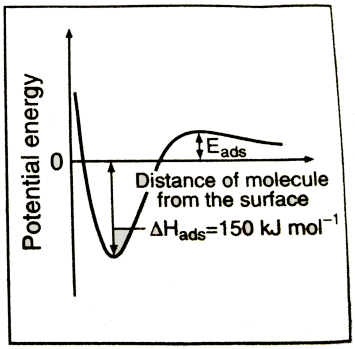
(I)



(II)



(III)



(IV)

A. I is physisorption and II is chemiosorption

B. I is physisorption and III is chemisorption

C. IV is chemisorption and II is chemisorption

D. IV is chemisorption and III is chemisorption

Answer: A::C

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30. When O_2 is adsorbed on ametallic surface, electron transfer occurs from the metal to O_2

The TRUE statement (s) regarding this adsorption is (are)

A. O_2 is physisorbed

B. heat is released

C. occupancy of π^*_{2P} of O_2 is increased

D. both length of O_2 is increased

Answer: B::C::D

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31. The correct statement (s) about surface properties is (are)

A. Cloud is an emulsion type of colloidal in which liquid is dispersed phase and gas is dispersion medium

B. Adsorption is accompained by decrease in enthalpy and decrease in entropy of the system

C. Brownian motion of colloidal particles does not depend on the size of the particles but depends on viscosity of the solution

D. The critical temperature of ethane and nitrogen and 563K and 126 K, respectively . The adsorption of ethane will be more than of nitrogen on same amount of activated charcoal at a given temperature

Answer: B::D

Watch Video Solution

Assertion Reason Type Questions

1. Statements : A catalyst doesnot alter the equilibrium constant os a reaction .

Expabnations : A catalyst complex with the reactants and provides an alternate path wirh a lower energy of activation for the reacton .

The forwaord and forwad and reverse reactions are affected to the same extent .

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: A

 Watch Video Solution

2. Assertion (A): Hydrolyiss of ethyl acetate in the presence of acid is a reaction of first order whereas in the presence of alkali, it is a reaction of second order.

Reason (R): Acid acts as catalyst only whereas alkali act as one of the reactant.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: A

Watch Video Solution

3. Assertion(A): In chemisorption, adsorption keeps on increasing with temperature.

Reason(R): Heat keeps on providing more and more activation energy.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: D

 Watch Video Solution

4. (A) A reaction cannot become fast by itself unless a catalyst is added .

(R) A catalyst always increases the speed of a reaction.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: D

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5. Assertion(A): A catalyst speed up a reaction but does not participate in its mechanism.

Reason(R): A catalyst provides an alternative path of lower activation energy to the reactants.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: D

 Watch Video Solution

6. (A) Fruit formation process shows increase in rate with passage of time.

(R) Hydrolysis of ester is a homogeneous autocatalystic reaction.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: A

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7. Assertion(A): A catalyst speed up a reaction but does not participate in its mechanism.

Reason(R): A catalyst provides an alternative path of lower activation energy to the reactants.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: D

Watch Video Solution

8. Assertion(A): Catalysts are always transition metals.

Reason(R): Transition metals have variable oxidation state.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: B

 Watch Video Solution

9. The mass of nickel catalyst recovered after being used in the hydrogenation of an oil is less than mass of nickel added to the reaction .

(R) Catalyst take part in the reaction but are recovered in the end.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: B

Watch Video Solution

10. Assertion(A): All enzymes are proteins, but all proteins are not enzymes.

Reason(R): Enzymes are biocatalysts and

posses a stable configuration having active sites.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: B

 Watch Video Solution

11. (A) The reaction of oxalic acid with acidified $KMnO_4$ is first slow and then proceeds with faster speed. (R) Acidified $KMnO_4$ is a strong oxidising agents.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: B

Watch Video Solution

12. (A) For adsorption ΔG, ΔS, and ΔH all have negative value.

(R) Adsorption is a spontanous process accompained by decrease in randomness.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: A

 Watch Video Solution

13. Assertion: A gas with higher critical temperature gets adsorbed to more extent than a gas with lower critical temperature.

Reason: The easily liquefiable gases get adsorbed to more extent which have higher critical temperature.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: B

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14. Assertion(A): Physical adsorption of molecules on the surface requires activation energy.

Reason(R): Because the bonds of adsorbed molecules are broken.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: D

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15. Assertion(A): Activity of an enzyme is pH dependent.

Reason(R): Change in pH affects the solution of the enzyme in water.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: B

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16. Assertion: Alcohols are dehydrated to hydrocarbons in the presence of acidic zeolites.

Reason: Zeolites are pourous catalysts.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: B

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17. (A) ZSM-5 is used as a catalyst in petrochemical industries.

(R) Zeolites are three-dimensional network

silicates in which some atoms are replaced by luminium atoms.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: B

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18. (A) A catalyst increases the rate of areaction.

(R)In presence of a catalyst, the activation energy of the reaction increases.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: B

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19. (A) NO is used as ahomogeneous catalyst for oxidation of CO .

$2CO + O_2 \rightarrow 2CO_2$

NO increases the rate of oxidation.

A. If both (A) and (R) are true and (R) is the correct explanation of (A).

B. If both (A) and (R) are true but (R) is not the correct explanation of (A).

C. If (A) is correct but (R) is incorrect.

D. If (A) and (R) are both incorrect.

Answer: B

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Matrix Matching Type Questions

1. Match the following columns

Column-I (Reaction)	Column-II (Catalyst)
(a) $2KClO_3(s) \longrightarrow 2KCl(s) + 3O_2(g)$	(p) Al_2O_3
(b) $2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$	(q) Pt
(c) $2H_2O_2(l) \longrightarrow 2H_2O(l) + O_2(g)$	(r) V_2O_5
(d) $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$	(s) MnO_2

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2. Match the following columns

List-I	List-II	List-III
(a) Oxidation of SO_2 to SO_3 in lead chamber process	(p) NO	(u) Positive catalyst
(b) Synthesis of methanol from CO and H_2	(q) Pt	(v) Poisoned by CO
(c) Oxidation of CO to CO_2	(r) V_2O_5	(w) Heterogeneous
(d) Oxidation of NH_3 to NO in Ostwald's process	(s) Rh	(x) Homogeneous

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3. Match the following columns

Column-I	Column-II
(a) ZSM-5	(p) $Na_2K_2CaMg(AlO_2)_2(SiO_2)_2 \cdot 6H_2O$
(b) Erionite	(q) Catalyst to convert alcohol to gasoline (petrol)
(c) Gemelinite	(r) $Na_2Ca(AlO_2)_2(SiO_2)_4 \cdot 6H_2O$
(d) Cavity size 550 pm	(s) $H_x[(AlO_2)_x(SiO_2)_{96-x}] \cdot 16H_2O$

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4.

List-I	List-II
(a) Mo	(p) Promoter
(b) Cu	(q) Negative catalyst
(c) TEL	(r) Decomposition of hydrogen peroxide
(d) Glycerine	(s) Haber process

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5. Match the following columns

Column-I	Column-II
(a) Removal of water by silica gel	(p) Absorption
(b) Removal of water by anhydrous $CaCl_2$	(q) Adsorption
(c) Fermentation of cane sugar to get ethanol	(r) Negative catalysis
(d) Alcohol is added in a sample of chloroform	(s) Enzyme catalysis

6. Match the following columns

Column-I	Column-II
(a) $BaSO_4$	(p) Inhibitor for decomposition of H_2O_2
(b) Acetamide	(q) Catalyst
(c) Zeolite	(r) Removes hardness of water
(d) Nickel	(s) Poison for Pd in Lindlar's catalyst

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7. Match the following columns

Column-I	Column-II
(a) Persorption	(p) H_2 on Ni surface
(b) Sorption	(q) CH_3OH in chabazite
(c) Negative adsorption	(r) NH_3 in H_2O
d) Occlusion	(s) Dil. NaCl on blood charcoal

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Linked Comprehension Type Questions

1. Only the surface atoms in an adsorbent play an active role in adsorption. These atoms possess some residual force such as van der Waals forces and chemical forces. In the process of adsorption. Weak adsorbate is substituting by strong adsorbete. Activated charcoal used in the gas mask is already exposed to the atmospheric air, so gases and

water vapours in air are adsorbed on its surface. When the mask is exposed to chlorine atmosphere, the gases are displaced by chlorine. In general, easily liquefiable gases such as $CO_2, NH_3, Cl_2,$ and SO_2 are adsorbed to a greater extent than the elemental gases, e.g., $H_2, N_2, O_2,$ He, etc.

Gas mask works on the principle of

A. Physical adsorption

B. Chemical adsorption

C. both physical and chemical adsorption

D. absorption

Answer: C

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2. Only the surface atoms in an adsorbent play an active role in adsorption. These atoms possess some residual force such as van der Waals forces and chemical forces. In the process of adsorption. Weak adsorbate is substituting by strong adsorbete. Activated

charcoal used in the gas mask is already exposed to the atmospheric air, so gases and water vapours in air are adsorbed on its surface. When the mask is exposed to chlorine atmosphere, the gases are displaced by chlorine. In general, easily liquefiable gases such as $CO_2, NH_3, Cl_2,$ and SO_2 are adsorbed to a greater extent than the elemental gases, e.g., $H_2, N_2, O_2,$ He, etc.

Which of the following gases will be most easily adsorbed by the charcoal in the gas mask?

A. H_2

B. O_2

C. N_2

D. SO_2

Answer: D

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3. Only the surface atoms in an adsorbent play an active role in adsorption. These atoms possess some residual force such as van der

Waals forces and chemical forces. In the process of adsorption. Weak adsorbate is substituting by strong adsorbete. Activated charcoal used in the gas mask is already exposed to the atmospheric air, so gases and water vapours in air are adsorbed on its surface. When the mask is exposed to chlorine atmosphere, the gases are displaced by chlorine. In general, easily liquefiable gases such as $CO_2, NH_3, Cl_2,$ and SO_2 are adsorbed to a greater extent than the elemental gases, e.g., $H_2, N_2, O_2,$ He, etc.

Gas mask contains

A. charcoal granules

B. powered charcoal

C. calcium carbonate

D. Fuller's earth

Answer: B

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4. Only the surface atoms in an adsorbent ,play an active role in adsorption .These atoms posses some residual forces likes van der

waal's forces and chemical forces. ltbRgt In the process of adsorption ,weak adsorbate is constituted by strong adsorbate. Activated charcoal used in gas mask is already exposed to the atmospheric air, so the gases and water vapours in the air are adsorbed on its surface. When the mask is exposed to chlorine atmosphric, the gases are displaced by chlorine. Porous and finely powered solids ,e.g, charcoal and Fuller's earth adsorb more as compared to the hard non-porous material.It is due to this property that the powered charcoal is used in gas masks. In general, easily

liquefiable gases likesCO_2, NH_3 ,Cl_2 and SO_2 ,etc. are adsorbed to a greater extent than the elemental gases , e.g, H_2, N_2 ,O_2, He, etc.

Which of the following gas molecules has maximum value of enthalpy of physisorption in a gas mask ?

A. C_2H_6

B. Ne

C. H_2O

D. H_2

Answer: C

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5. Only the surface atoms in an adsorbent play an active role in adsorption. These atoms possess some residual force such as van der Waals forces and chemical forces. In the process of adsorption. Weak adsorbate is substituting by strong adsorbete. Activated charcoal used in the gas mask is already exposed to the atmospheric air, so gases and water vapours in air are adsorbed on its surface. When the mask is exposed to chlorine

atmosphere, the gases are displaced by chlorine. In general, easily liquefiable gases such as $CO_2, NH_3, Cl_2,$ and SO_2 are adsorbed to a greater extent than the elemental gases, e.g., $H_2, N_2, O_2,$ He, etc.

Which of the following gases will substitute O_2 from adsorbed charcoal?

A. H_2

B. N_2

C. Ar

D. Cl_2

Answer: D

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6. Freundlich adsorption isotherm is obeyed by the adsorption where the adsorbate forms a multimolecular layer on the surface of adsorbent .In such cases, the degree of adsorption varies linearly with pressure but at high pressure, it becomes independent of pressure

The relation of Freundlich adsorption

isotherm is :

$$\frac{x}{m} = kP^{1/n}$$

where ,K and n are constants.

Langmuir adsorption isotherm is obeyed by the adsorption where the adsorbate forms only a unimolecular adsorbed layer. The mathematical relation of Langmuir isotherm is :

$$\frac{x}{m} = \frac{aP}{1+bP}$$

When $\log\left(\frac{x}{m}\right)$ is plotted against log P, we get a straight line with slope (1/n).

(a) True (b) False

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7. Freundlich adsorption isotherm is obeyed by the adsorption where the adsorbate forms a multimolecular layer on the surface of adsorbent .In such cases, the degree of adsorption varies linearly with pressure but at high pressure, it becomes independent of pressure

The relation of Freundlich adsorption isotherm is :

$$\frac{x}{m} = kP^{1/n}$$

where ,K and n are constants.

Langmuir adsorption isotherm is obeyed by the adsorption where the adsorbate forms only a unimolecular adsorbed layer. The mathematical relation of Langmuir isotherm is :

$$\frac{x}{m} = \frac{aP}{1 + bP}$$

The degree of adsorption (x/m) at low pressure will be :

$$\frac{x}{m} = a$$

(a) True (b) False

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8. Freundlich adsorption isotherm is obeyed by the adsorption where the adsorbate forms a multimolecular layer on the surface of adsorbent .In such cases, the degree of adsorption varies linearly with pressure but at high pressure, it becomes independent of pressure

The relation of Freundlich adsorption isotherm is :

$$\frac{x}{m} = kP^{1/n}$$

where ,K and n are constants.

Langmuir adsorption isotherm is obeyed by

the adsorption where the adsorbate forms only a unimolecular adsorbed layer. The mathematical relation of Langmuir isotherm is :

$$\frac{x}{m} = \frac{aP}{1 + bP}$$

When $\left(\frac{x}{m}\right)$ is plotted against $\frac{1}{p}$,we get a straight line slope (1/a) and intercept (b/a).

(a) True (b) False

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9. Freundlich adsorption isotherm is obeyed by the adsorption where the adsorbate forms a multimolecular layer on the surface of adsorbent .In such cases, the degree of adsorption varies linearly with pressure but at high pressure, it becomes independent of pressure

The relation of Freundlich adsorption isotherm is :

$$\frac{x}{m} = kP^{1/n}$$

where ,K and n are constants.

Langmuir adsorption isotherm is obeyed by

the adsorption where the adsorbate forms only a unimolecular adsorbed layer. The mathematical relation of Langmuir isotherm is :

$$\frac{x}{m} = \frac{aP}{1+bP}$$

In the mathematical relation of Freundlich adsorption isotherm ,the value of (1/n) is $0 \leq \frac{1}{n} \leq 1$.

(a) True (b) False

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10. Freundlich adsorption isotherm is obeyed by the adsorption where the adsorbate forms a multimolecular layer on the surface of adsorbent .In such cases, the degree of adsorption varies linearly with pressure but at high pressure, it becomes independent of pressure

The relation of Freundlich adsorption isotherm is :

$$\frac{x}{m} = kP^{1/n}$$

where ,K and n are constants.

Langmuir adsorption isotherm is obeyed by

the adsorption where the adsorbate forms only a unimolecular adsorbed layer. The mathematical relation of Langmuir isotherm is :

$$\frac{x}{m} = \frac{aP}{1 + bP}$$

Freundlich adsorption isotherm is valid for chemisorption .

(a) True (b) False

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Self Assessment Section I

1. At high pressure ,Langmuir adsorption isotherm takes the form :

A. $\frac{x}{m} = \frac{ap}{1 + bP}$

B. $\frac{x}{m} = \frac{a}{b}$

C. $\frac{x}{m} = aP$

D. $\frac{m}{x} = \frac{b}{a} + \frac{1}{aP}$

Answer: B

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2. which of the following is used to adsorb water ?

A. Silica gel

B. anhydrous $CaCl_2$

C. coal

D. coke

Answer: A

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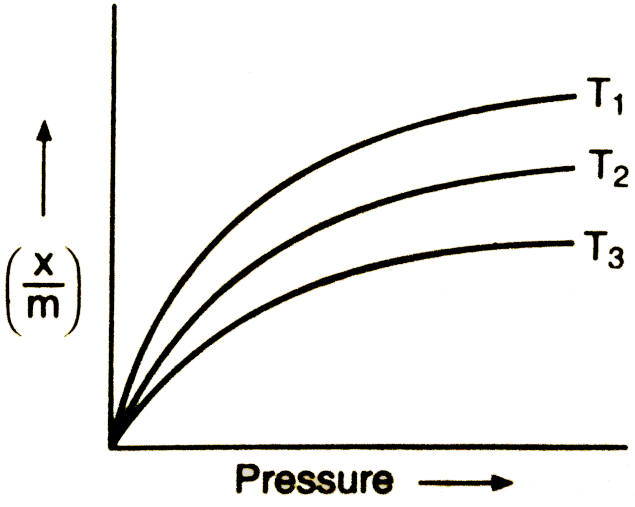
3. Select the correct option for the following graph :



A. $T_1 > T_2 > T_3$

B. $T_1 = T_2 = T_3$

C. $T_1 < T_2 < T_3$

D. $T_1 > T_2 < T_3$

Answer: C

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4. Which of the following substances adsorbs H_2 gas most strongly ?

A. Platinum black

B. Nickel powder

C. Activated charcoal

D. Silica gel

Answer: A

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5. the volume of gases NH_3, CO_2 and H_2 adsorbed by one gram of charcoal at 300 K are in order of :

A. $CH_4 > CO_2 > NH_3$

B. $HN_3 > CH_4 > CO_2$

C. $NH_3 > CO_2 > CH_4$

D. $CO_2 > NH_3 > CH_4$

Answer: C

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6. Activated charcoal is prepared by :

A. adding $Ba_3(PO_4)_2$ to charcoal

B. treatment with conc. HNO_3

C. heating charcoal with steam to make it more porous

D. adding silica to charcoal

Answer: C

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7. In the reactions $2SO_2 + O_2 \xrightarrow[As_2O_3]{Pt} 2SO_3$, As_2O_3 acts as a

A. catalystic promoter

B. induced catalyst

C. catalystic poison

D. autocatalyst

Answer: C

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8. In Rosenmund reactions, presence of $BaSO_4$ acts as â€¦â€¦â€¦ for Pd.

A. promoter

B. moderator

C. inhibitor

D. poison

Answer: D

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Self Assessment Section Ii

1. Which of the following are correct about a catalyst ?

A. it participates in the reaction but is recovered at last

B. it does not affect ΔG

C. It doesnot affect ΔH

D. It alters the mechanism of reaction

Answer: A::B::C::D

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2. Which of the following statements are correct ?

A. Physical adsorption is of multimolecular layer

B. Degree of chemical adsorption increases with increase in temperature

C. Adsorption increases the surface energy

D. Sometimes solvent is adsorbed in preference to solute

Answer: A::B::D

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3. Which of the following are Zeolites ?

A. Granite

B. Faujasite

C. Natrolite

D. Thomisite

Answer: B::C::D

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4. Which of the following acts as a negative catalysts ?

A. Ehtanol in oxidation of cloroform

B. Tetraethyl lead used as antiknocking agent

C. Glycerol in the decomposition of H_2O

D. Fe in the formation of ammonia by Haber process

Answer: A::B::C

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5. Select the correct statements about enzymes :

A. Enzymes are biological catalysts found in organisms

B. All enzymes are protiens

C. Enzymes can catalyse any reaction

D. Enzymes' activity is optimum $27^{\circ} C$

Answer: A::B::D

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Self Assessment Section Iii

1. Match the Column-I with Column-II

Column-I (Process)	Column-II (Catalyst)
(a) Cracking of hydrocarbons	(p) Ni
(b) Ostwald's process	(q) NO
(c) Sulphuric acid manufacture	(r) Pt
(d) Catalytic converter	(s) NiO

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2. Match the Column-I with Column-II

Column-I (Catalyst)	Column-II (Process)
(a) Ni	(p) Cracking of hydrocarbons
(b) $AlCl_3$	(q) Fischer-Tropsch process
(c) Co/Al_2O_3	(r) Hydrogenation of oil
(d) Zeolite	(s) Friedel-Crafts reaction

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3. Match the Column-I with Column-II

Column-I	Column-II
(a) Chemisorption	(p) Exothermic
(b) Physisorption	(q) Endothermic
(c) Desorption	(r) Removal of adsorbed substance
(d) Activation of adsorbent	(s) Specific

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4. Match the catalysts to the correct processes

:

Catalyst	Process
(a) $TiCl_3$	(p) Wacker process
(b) $PdCl_2$	(q) Ziegler-Natta polymerization
(c) $CuCl_2$	(r) Contact process
(d) V_2O_5	(s) Deacon's process

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