Chapter Four : Chemical Changes

Creative Essay Type

1. ▶ Observe the reaction :

$PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$ and here 60% of PCl_5 is dissociated at 1atm at 25°C. *[Mirzapur Cadet college, Tangail]*

a. What is chemical equilibrium? 1
b. What is meant by buffer solution? 2
c. Determine the value of K_c of above reaction? 3
d. Derive the K_p expression for the above reaction. 4

Ans: See HSC EV Chemistry 1st Paper 4th Chapter Note Ques. No. 55 of Answer Paper.

2. ▶ Read the given stem :

(A)	(B)	(C)
60mL 0.1M HA solution $\alpha = 19.8\%$	20mL 0.1M BOH solution $\alpha = 100\%$	80mL 0.25M HB solution $\alpha = 16.7\%$

[Notre Dame College, Dhaka]

a. What is hybrid orbital? 1
b. Is the set of quantum no. n = 3, l = 2, m = ±2 possible for an element 'Z(19)'- explain? 2
c. Find the pH value of solution 'A'. 3
d. In A & B mixture & B & C mixture, which one is more preferable as buffer solution- analyze mathematically. 4

Ans: See HSC EV Chemistry 1st Paper 4th Chapter Note Ques. No. 34 of Answer Paper.

3. ▶

HF (A-mixture) ← 10% (w/v) NaOH (B-mixture) → CH_3COOH (C-mixture)

[Birshrestha Noor Mohammad Public College, Dhaka]

a. Write Hess law. 1
b. Sc is not transition-explain. 2
c. Calculate pH of alkaline solution. 3
d. Which one in between AB & BC mixture has high neutralization energy? Analyze it. 4

Ans: See HSC EV Chemistry 1st Paper 4th Chapter Note Ques. No. 38 of Answer Paper.

4. ▶

(C)	(D)
NaOH 12 mL 0.05 M	CH_3COOH 156 mL 0.05 M $Ka = 1.85 \times 10^{-5}$

[Cumilla Cadet College, Cumilla]

a. What is heat of solution? 1
b. Why is 2d orbital not possible? 2
c. Calculate pH of mixed solution (C + D) of given stem. 3
d. How pH of the mixed solution (C + D) of given stem remain unchanged after addition of small amount of acid and base? Analyze with mechanism. 4

Ans: See HSC EV Chemistry 1st Paper 4th Chapter Note Ques. No. 70 of Answer Paper.

▸ Question No. a (Knowledge based)

Ques-1. Define pH. *[D.B. 17]*

Ans: The negative logarithm of the molar concentration of H^+ ion in a solution is known as pH of the solution.

Ques-2. Write down Hess's law. *[D.B. 17]*

Ans: If a reaction can take place by single step or several steps, the overall change in enthalphy is the same whichever route is followed with same initial reactants and final products.

Ques-3. What is a buffer action? *[R.B. 17]*

Ans: The mechanism of prevention of change of pH even after addition of acid or base is called buffer action.

Ques-4. What is green chemistry? *[C. B. 17]*

Ans: Green chemistry is the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances.

Ques-5. What is rate of reaction? *[S. B 16]*

Ans: The rate of reaction is the change in concentration over the change in time.

Ques-6. What is ionic product? *[J.B 17]*

Ans: At ionized stated, the product of concentration of ions of a compound is called ionic product.

▸ Question No. b (Comprehension based)

Ques-1. Why is the neutralization enthalpy of a strong acid and a strong base is a constant value? *[D.B. 17]*

Ans: Heat of neutralization of strong acid and strong base is constant and if is −57.34 kJ approx. In aqueous solution strong acid like HCl acid and strong base like NaOH are completely ionized as follows,

$HCl_{(aq)} \rightarrow H^+_{(aq)} + Cl^-_{(aq)}$; $NaOH_{(aq)} \rightarrow Na^+_{(aq)} + OH^-_{(aq)}$

When a strong acid reacts with a strong base, the cation of the base and the anion of the acid remain unchanged, they are called separated ions. In reality the H^+ of the acid and the OH^- of the base combine to produce.

$H^+ + OH^- \longrightarrow H_2O$

The heat of neutralization of a strong acid and a strong base is infact the heat of this ionic reaction. For this, the heat of neutralisation of a strong acid and a strong base is constant.

Ques-2. What is understood by the ionic product of water? *[R.B. 17]*

Ans: At a temperature, the product of the concentration of hydrogen ion (H^+) and hydroxyl ion (OH^-) in pure water is constant. **A**

$[H^+] \times [OH^-] = K \times [H_2O] = K_w$ = constant.

Here, K_w is called the ionic product of water. Its value changes slightly with change of temperature. At 25°C its value is taken as 1×10^{-14}.

Ques-3. Why are enzymes called biocatalysts? *[S.B.17]*

Ans: Enzyme is a lifeless, amorphous, nitrogenous complex orgain substance secreted from yeast. Enzyme is a large portentous molecule. At different points of this large molecule there are some actinated sites. Reagent molecules attach to there points and form intermediate unstable compounds which later dissociates and form product and the enzyme is reaction. In this way enzyme fastens the reaction by lowering the activation energy by supplying activated points and thus used as catalyst in organic reactions.

Creative Multiple Choice

1. What is the pH of 0.005M H_2SO_4 solution? *[D.B.-17]*
   ⓐ 2.3 ⓑ 2.0
   ⓒ 1.3 ⓓ 1.0 **ⓑ**

2. For the reversible reactions given —
   $M \rightleftharpoons N$, $K_C = 1$; $N \rightleftharpoons P$, $K_C = 3$;
   $P \rightleftharpoons Q$, $K_C = 5$ and
   $M \rightleftharpoons Q$ the value of K_c will be –
   ⓐ 3 ⓑ 5
   ⓒ 10 ⓓ 15 **ⓓ**

3. Which of the following acts as autocatalyst for the redox reaction of acidic $KMnO_4$ and oxalic acid? *[R.B.-17]*
   ⓐ MnO_4^- ⓑ Mn^{2+}
   ⓒ CrO_4^{2-} ⓓ K^+ **ⓑ**

4. In which case, $A + B \rightleftharpoons C + D$ reaction proceeds to almost completion?
   ⓐ $k = 10^3$ ⓑ $k = 10^{-2}$
   ⓒ $k = 10$ ⓓ $k = 1$ **ⓐ**

5. Degree of dissociation of weak acid —
   ⓐ $\sqrt{\frac{K_h}{C}}$ ⓑ $\sqrt{\frac{C}{K_a}}$
   ⓒ $\sqrt{\frac{K_a}{C}}$ ⓓ $\sqrt{K_aC}$ **ⓒ**

6. What is the pH of 1% HCl solution? *[All Board-18]*
   ⓐ 0.56 ⓑ 1.0
   ⓒ 2.6 ⓓ 5.6 **ⓐ**

7. Which of the following is the expression for Ostwald's law of dilution?
   ⓐ $K_a = \frac{\alpha C}{1-\alpha^2}$ ⓑ $K_a = \frac{\alpha^2}{1-\alpha^2}$
   ⓒ $K_a = \frac{\alpha^2 C}{1-\alpha}$ ⓓ $K_a = \alpha^2 C$ **ⓒ**

8. What is the value of heat of neutralisation for the reaction— $CH_3COOH_{(aq)} + NH_4OH_{(aq)} \longrightarrow CH_3COONH_{4(aq)} + H_2O(l)$ *[R.B.-17]*
   ⓐ $-50.4\ kJmol^{-1}$ ⓑ $-55.2\ kJmol^{-1}$
   ⓒ $-57.2\ kJmol^{-1}$ ⓓ $-68.6\ kJmol^{-1}$ **ⓐ**

9. The bond energies of C–H, C–Cl, Cl–Cl and H–Cl are 413 $kJmol^{-1}$, 328 $kJmol^{-1}$, 243 $kJmol^{-1}$ and 433 $kJmol^{-1}$ respectively. Calculate the ΔH for the reaction– $CH_4 + Cl_2 = CH_3Cl + HCl$ *[R.B.-17]*
   ⓐ $105\ kJmol^{-1}$ ⓑ $100\ kJmol^{-1}$
   ⓒ $95\ kJmol^{-1}$ ⓓ $90\ kJmol^{-1}$ **ⓐ**

10. Which of the following is irreversible in an open vessel?
    ⓐ $CH_3COOC_2H_5 + H_2O \longrightarrow C_2H_5OH + CH_3COOH$
    ⓑ $CaCO_3 \longrightarrow CaO + CO_2$
    ⓒ $AgNO_3 + NaCl \longrightarrow NaNO_3 + AgCl$
    ⓓ $CuSO_4.5H_2O \longrightarrow CuSO_4.3H_2O + 2H_2O$ **ⓑ**

11. Which of the following is a hypoacid? *[D.B. -16]*
    ⓐ H_3PO_3 ⓑ H_3PO_2
    ⓒ H_3PO_4 ⓓ HPO_3 **ⓑ**

12. Which of the following acid has the highest strength? *[All Board-18]*
    ⓐ H_2SO_4 ⓑ $HClO_4$
    ⓒ H_3PO_4 ⓓ HNO_3 **ⓑ**

13. Which catalyst is used for the production of H_2SO_4 in contact process? *[D.B.-16]*
    ⓐ Fe ⓑ Ni
    ⓒ Al_2O_3 ⓓ V_2O_5 **ⓓ**

14. The K_c expression for the reaction $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$ is — *[R.B.-16]*
    ⓐ $K_c = \frac{[CaO]}{[CaCO_3]}$ ⓑ $K_c = \frac{[CaO][CO_2]}{[CaCO_3]}$
    ⓒ $K_c = [CO_2]$ ⓓ $K_c = [CaO]$ **ⓒ**

15. What is the ionic product of pure water at room temperature? *[All Board-18]*
    ⓐ 1×10^{-14} ⓑ 1×10^{14}
    ⓒ 1×10^{-7} ⓓ 1×10^{7} **ⓒ**

16. What is the pH of 12.5% NaOH? *[R.B.-16]*
    ⓐ 12.51 ⓑ 13.51
    ⓒ 14.51 ⓓ 15.51 **ⓒ**

17. With sodium hydroxide, which of the following acid has the maximum heat of neutralisation? *[All Board-18]*
    ⓐ HNO_3 ⓑ HF
    ⓒ HCl ⓓ H_2SO_4 **ⓑ**

18. If a change (temperature, pressure, concentration) is made in a system at equilibrium, the equilibrium will shift in such a way as to reduce the effect of the change. Which of the following principle support the system?
    ⓐ Avogadro's law
    ⓑ Le-Chatelier's principle
    ⓒ Law of conservation
    ⓓ Faraday's law of electrolysis **ⓑ**

19. What will be the pH of the solution made from addition of 50 mL 0.09 M NaOH solution to 50 mL 0.175 M HCOOH solution? ($K_a = 1.8 \times 10^{-4}$) *[Dj.B.-17]*
    ⓐ 10.2305 ⓑ 5.9673
    ⓒ 5.6957 ⓓ 3.7695 **ⓓ**

20. $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
    The following amounts are found at equilibrium in a 3.00L container at 400°C. 0.00420 mole N_2, 0.516 mole H_2 and 0.03357 mole NH_3. Calculate the value of K_c.
    ⓐ $1.76\ dm^3\ mol^{-2}$ ⓑ $1.23\ dm^3\ mol^{-1}$
    ⓒ $1.76\ dm^3\ mol^{-2}$ ⓓ $1.23\ dm^6 mol^{-2}$ **ⓐ**

21. From the following halides, which one is the strongest acid?
    ⓐ HCl ⓑ HBr
    ⓒ HF ⓓ HI **ⓓ**

22. Which reaction shows $K_p = K_c$?
    ⓐ $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
    ⓑ $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
    ⓒ $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$
    ⓓ $CO(g) + 2H_2(g) \rightleftharpoons CH_3OH(g)$ **ⓒ**

23. How many moles of CO_2 are produced from complete combustion of 1 mole of C_2H_5OH?
    ⓐ 1 mol ⓑ 2 mol
    ⓒ 3 mol ⓓ 4 mol **ⓑ**

24. Which is the irreversible reaction?
    ⓐ $2NO_2 \rightarrow N_2O_4$ ⓑ $H_2 + I_2 \rightarrow 2HI$
    ⓒ $2KClO_3 \rightarrow 2KCl + 3O_2$
    ⓓ $CuSO_4.5H_2O \rightarrow CUSO_4.3H_2O + 2H_2O$ **ⓒ**

25. What is the pH of decimolar ethanoic acid ($K_a = 1.8 \times 10^{-5}$)? *[Dj.B.-17]*
    ⓐ 2.872 ⓑ 11.128
    ⓒ 11.281 ⓓ 11.821 **ⓐ**

26. Which is the decreasing order of alkalinity?
ⓐ $F^- > Cl^- > I^- > Br^-$ ⓑ $Br^- > Cl^- > F^- > I^-$
ⓒ $F^- > Cl^- > Br^- > I^-$ ⓓ $F^- > I^- > Br^- > Cl^-$ **ⓒ**

27. Which is the green solvent? *[S.B.-17]*
ⓐ Solid Carbondioxide ⓑ Carbon dioxide gas
ⓒ CO_2 below 31.1° C ⓓ CO_2 at 72.8°C **ⓒ**

28. At what pH does hair show brightness and freshness?
a. 4.1 ⓑ 6.1
ⓒ 7.4 ⓓ 8.1 **ⓐ**

29. Which is the unit of rate constant of reation? *[S.B.-17]*
ⓐ mol LS^{-1} ⓑ mol $L^{-1}S^{-1}$
ⓒ L $mol^{-1}S^{-1}$ ⓓ mol $L^{-1}S$ **ⓑ**

30. How does a buffer solution control pH when a small amount of NaOH solution is added to the buffer solution?
ⓐ Produced OH^- is converted to weak acid
ⓑ Produced OH^- is converted to H_2O
ⓒ Produced H^+ is converted to weak alkali
ⓓ Produced Na^+ is converted to salt **ⓑ**

31. The combustion enthalpies of CS_2, S and carbon are –1060.4 kJ, – 296.1 kJ and – 406.13 kJ respectively. What is the heat of formation of carbon disulfide?
ⓐ + 62.07 kJ ⓑ – 62.07 kJ
ⓒ 627 kJ ⓓ – 627 kJ **ⓐ**

32. If K_1 is the equilibrium constant of the reaction— $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$, then find equilibrium constant K_2 of the reaction $\frac{1}{2}N_{2(g)} + \frac{3}{2}H_{2(g)} \rightleftharpoons NH_{3(g)}$ *[R.B.-17]*
ⓐ $K_2 = \frac{1}{\sqrt{K_1}}$ ⓑ $K_2 = K_1$
ⓒ $K_2 = \sqrt{K_1}$ ⓓ $K_2 = \frac{1}{2}K_1$ **ⓒ**

33. The amount of energy absorbed for breaking down of 1mol H–H bond is 435 kJ and for breaking down of 1 mol of O–H bond is 462.5 kJ. Again, amount of energy released for the formation of O–H bond is 462.5 kJ. What is the ΔH value of the reaction —
$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(\ell)\ \Delta H = ?$
ⓐ +933kJ ⓑ +241kJ
ⓒ –241kJ ⓓ –63kJ **ⓒ**

34. Which of the following acts as negative catalyst in the reaction — $2H_2O_2 \longrightarrow 2H_2O + O_2$?
ⓐ Manganese dioxide ⓑ Glycerine
ⓒ Vanadium pentoxide ⓓ Platinum **ⓑ**

35. Which enzyme present in yeast affects the production of ethanol from glucose?
ⓐ invertase ⓑ urease
ⓒ amylase ⓓ zymase **ⓓ**

36. What is the ionic product of water at 25°C?
ⓐ 7 ⓑ 14
ⓒ 10^{-14} ⓓ 6.023×10^{23} **ⓒ**

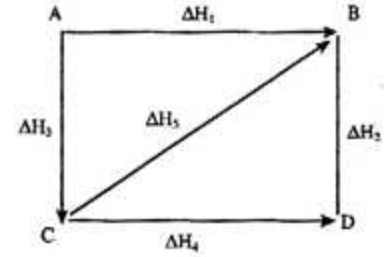
37. In the reaction $2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$ —
i. catalyst Pt ii. catalyst poison Al_2O_3
iii. reaction rate increases in presence of V_2O_5
Which is correct?
ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii **ⓑ**

38. Characteristics of catalyst —
i. increases the reaction rate
ii. decreases the reaction rate
iii. destroys bacteria
Which is correct?
ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii **ⓐ**

39. Applicable to Hess's law of heat summation —
i. Heat of reaction can be determined
ii. Heat of formation of organic compound can be determined
iii. Heat of solution can be determined
Which one is correct?
ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **ⓐ**

40. Protophilic compounds are —
i. NH_4OH ii. $NH_2 - NH_2$
iii. $CH_3 - NH_2$
Which one is correct?
ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **ⓑ**

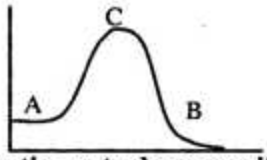
41. Helium gas is added to the reaction, $SOCl_{2(g)} \rightleftharpoons SO_{2(g)} + Cl_{2(g)}$ at equilibrium in a closed vessel. Things will happen —
i. more amount of $SOCl_2$ will be produced
ii. concentration of SO_2 will not decrease
iii. no change in the concentration of SO_2, Cl_2 and SO_2Cl_2
Which is correct?
ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **ⓑ**



42. Applicable to the figure — *[Dj.B.-17]*
i. $\Delta H_3 + \Delta H_4 = \Delta H_1 + \Delta H_2$
ii. $\Delta H_1 = \Delta H_3 + \Delta H_5$
iii. $\Delta H_4 = \Delta H_5 + \Delta H_2$
Which one is correct?
ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **ⓓ**

43. Used in agricultural field when pH is decreased —
i. Lime ii. Calcium fertilizer
iii. Magnesium fertilizer
Which is correct?
ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **ⓓ**

44.



Reaction rate decreases if —
i. A and B remains unchanged.
ii. Value of B increases more than A.
iii. B reduces and becomes less than A
Which is correct?
ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **ⓑ**

45. Principles of green chemistry are —
i. Syntheses of less hazardous chemicals
ii. Ensuring less use of renewable raw materials
iii. Reducing production of intermediate secondary products
Which one is correct?
ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **ⓒ**

46. Increase of temperature increases reaction rate, because — *[C.B.-17]*
i. Collisions of reactants increase
ii. Activation energy of reaction decreases
iii. Activation energy of reaction increases
Which one is correct?
ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **ⓓ**

47. For the reaction, $2SO_2 + O_2 + [X] \rightarrow 2SO_3 + heat$ —
i. Homogenous catalyst
ii. It happens in liquid phase
iii. NO is used as catalyst
Which is correct?
ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii **ⓑ**

48. Rate of reaction is — *[B.B.-17]*
i. rate of decrease of concentration of reactants
ii. rate of decrease of the amount of catalyst
iii. rate of increase of the concentration of products
Which is correct?
ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **ⓒ**

49. $A + B \rightleftharpoons C + D$, the reaction is —
i. reversible reaction
ii. the concentration of both reactants and products are same at equilibrium
iii. rate of forward reaction is equal to the rate of backward reaction at equilibrium
Which is correct?
ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii **ⓓ**

50. The reaction $H_2 + I_2 \rightleftharpoons 2HI$ is —
i. Endothermic reaction
ii. Amount of HI reduces when temperature is reduced at equilibrium
iii. No effect of pressure at equilibrium
Which is correct?
ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii **ⓓ**

51. For strong acid and strong alkali — *[C.B.-16]*
i. Heat of neutralisation
ii. H^+ and OH^- are present in the reaction
iii. Value of enthalpy is negative
Which is correct?
ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **ⓓ**

52. Increase of activation energy results — *[R.B.-15]*
i. in the increase of collision numbers
ii. in reducing rate of reaction
iii. the equilibrium attaining is delayed
Which one is correct?
ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii **ⓒ**

53. Higher value of dissociation constant in solution —
i. Concentration of H^+ increases
ii. Concentration of H^+ decreases
iii. Acidity increases
Which one is correct?
ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii **ⓑ**

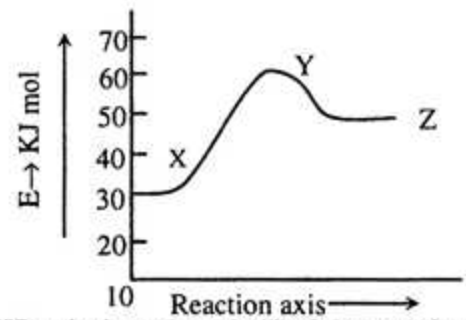
54. The buffer system which works to control blood pH –
i. Hydrogen ion ii. Hydroxyl ion
iii. Bicarbonate ion
Which one is correct?
ⓐ i and ii ⓑ i and iii
ⓒ iii ⓓ i, ii and iii **ⓒ**

Observe the stem and answer question number 55 and 56.
At equilibrium, 15.6% of PCl_5 is dissociated at 25°C and 1.5 atm. The partial pressures of PCl_5 and Cl_2 gas are 1.095 and 0.202 atm respectively. *[D.B.-17]*

55. What is the value of K_P?
ⓐ 2.74×10^{-2} atm ⓑ 2.84×10^{-2} atm
ⓒ 3.74×10^{-2} atm ⓓ 5.74×10^{-2} atm **ⓒ**

56. If PCl_5 is added to the reaction given in the stem —
i. The reaction proceeds forward
ii. The reaction proceeds backward
iii. Equilibrium will change
Which one is correct?
ⓐ i ⓑ i and iii
ⓒ iii ⓓ i, ii and iii **ⓑ**

Observe the following graph and answer to question numbers 57 and 58.



57. What is the value of ΔH of the reaction —
ⓐ + 60 kJ mol^{-1} ⓑ + 40 kJ mol^{-1}
ⓒ + 20 kJ mol^{-1} ⓓ + 10 kJ mol^{-1} **ⓒ**

58. More products will be obtained in the reaction, if —

i. the value of Z decreases
ii. the value of X increases
iii. the value of Z and X tend to increase

Which one is correct?

ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **a**

Read the stem and answer to question numbers 59 and 60.

At equilibrium, heating of 1 mole of N_2O_4 is heated in a closed vessel of 1 litre α mole gets dissociated. The total pressure of gaseous mixture is P. *[Ctg.B.-17]*

$N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$

59. The partial pressure of NO_2 at equilibrium —

ⓐ $\frac{2\alpha P}{1-\alpha}$ ⓑ $\frac{2\alpha \times P}{1+\alpha}$
ⓒ $\frac{\alpha \times P}{1+\alpha}$ ⓓ $\frac{\alpha \times P}{a-\alpha}$ **b**

60. Which relationship is correct for the reaction of the stem — *[Ctg.B.-17]*

i. $Kc = \frac{4\alpha^2}{(1-\alpha)V}$ ii. $Kp = \frac{4\alpha^2 P}{1-\alpha^2}$

iii. $Kp = \frac{(1-\alpha)P}{\alpha}$

Which one is correct?

ⓐ i and ii ⓑ ii and iii
ⓒ i and iii ⓓ i, ii and iii **a**

Observe the equations below and answer to the questions 61 and 62.

$CH_3 - COOH \rightleftharpoons CH_3 - COO^- + H^+$

$CH_3 - COONa \rightleftharpoons X^- + Na^+$

61. Which one represents 'X'?

ⓐ ethanoate ion ⓑ propanoate ion
ⓒ butanoate ion ⓓ pentanoate ion **a**

62. The buffer which contains a small amount of acid added to it reacts with which of the following?

ⓐ CH_3COOH ⓑ CH_3COONa
ⓒ CH_3COO^- ⓓ Na^+ **c**

Observe the following gaseous reversible reaction and answer the questions that follows:

$A_2(g) + B_2(g) \rightleftharpoons 2AB(g)$; $\Delta H = +ve$ *[Dj.B.-15]*

63. What happens when pressure is increased?

ⓐ Increases the concentration of products
ⓑ Kp increases
ⓒ Concentration of reactant increases
ⓓ No effect of pressure **d**

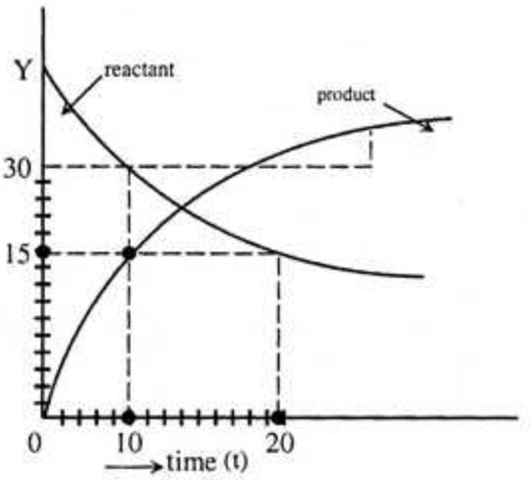
64. What happens when temperature is increased?

i. K_p increases ii. No change of equilibrium
iii. Equilibrium shifts to right

Which is correct?

ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii **b**

Observe the following graph and answer to the question numbers 65 and 66.



65. What is represented by the values of Y–axis?

ⓐ reaction rate ⓑ molar concentration
ⓒ pressure ⓓ temperature **b**

66. What will be the average rate according to the graph?

ⓐ 1.0 ⓑ 1.5
ⓒ 2.0 ⓓ 2.5 **b**

Answer to the question numbers 67 and 68.

Following reaction takes place when HCl is added to definite concentration of $Na_2S_2O_3$ solution :

$Na_2S_2O_3 + 2HCl \rightarrow 2NaCl + SO_2 + S + H_2O$

67. What is the average rate of the reaction if 10^{-4} mol of sulphur is precipitated in 10 seconds?

ⓐ 10^{-3} $mols^{-1}$ ⓑ 10^{-2} $mols^{-1}$
ⓒ 10^{-5} $mols^{-1}$ ⓓ 1.5×10^{-5} $mols^{-1}$ **c**

68. 10°C rise of temperature doubled the precipitation of sulphur. Because —

i. Number of molecules containing activation energy increases
ii. More activated molecules react
iii. Internal energy of molecules increase

Which is correct?

ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii **d**

Consider the following gaseous reaction and answer to the questions 69 and 70.

$A + B + 2X \rightarrow 2Y + Z + 2W$

69. What is the change that takes place in the reaction?

ⓐ Volume has been expanded
ⓑ Volume is reduced
ⓒ No change of volume
ⓓ Volume of reactant = volume of product **a**

70. What happens when pressure is decreased?

ⓐ Amount of product increases
ⓑ Amount of product decreases
ⓒ No change of products
ⓓ The reaction stops **c**

From the following stem, answer to the questions 71 and 72.

$CH_4 + 2O_2 = CO_2 + 2H_2O$

71. Addition of oxygen to the reaction at equilibrium —

i. increases the amount of H_2O
ii. reduces the amount of CH_4
iii. increases the value of equilibrium constant

Which one is correct?

ⓐ i and ii ⓑ i and iii
ⓒ ii and iii ⓓ i, ii and iii **d**

72. What is the value of Δn, when H_2O is a liquid?

ⓐ –2 ⓑ –1
ⓒ 0 ⓓ 1 **a**