



Wings

Physical Chemistry_Revision_Set II

DATE: 08-01-2022

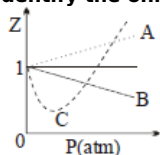
TIME: 200mins

1 Mean free path of molecules in a rigid container will be

- (A) Increases on increasing temperature
(B) Decreases on increasing temperature
(C) unchanged on changing temperature
(D) Increases some where and decreases

2 The given graph represents the variation of Z (compressibility factor = $\frac{PV}{nRT}$) versus P, for three real gases A, B and C.

Identify the only incorrect statement.

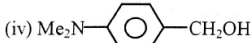
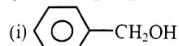


- (A) for the gas A, $a = 0$ and its dependence on P is linear at all pressure
(B) for the gas B, $b = 0$ and its dependence on P is linear at all pressure
(C) for the gas C, which is typical real gas for which neither a nor $b = 0$. By knowing the minima and the point of intersection, with $Z = 1$, a and b can be calculated.
(D) At high pressure, the slope is positive for all real gases A, B and C.

3 The equilibrium constant for the reaction $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ at temperature (T) is 4×10^{-4} . The value of K_c for the reaction $NO(g) \rightleftharpoons \frac{1}{2} N_2(g) + \frac{1}{2} O_2(g)$ at the same temperature is:

- (A) 4×10^{-4}
(B) 50
(C) 2.5×10^2
(D) 0.02

4 Q.89 Correct order of the reactivity of the given alcohols towards the substitution with $(NaBr + H_2SO_4)$:



- (1) (i) > (ii) > (iii) > (iv)
(2) (iv) > (ii) > (i) > (iii)
(3) (iii) > (i) > (ii) > (iv)
(4) (iv) > (iii) > (ii) > (i)

- (A) 1
(B) 2
(C) 3
(D) 4

- 5 The pH of the solution containing 0.1 M HCl and 0.1 M CH₃COOH is
 (A) 1 (B) 0.7
 (C) 2 (D) 1.3
- 6 If the solubility of lithium sodium hexafluoroaluminate is 's' mole/lit, than its solubility product will be
 (A) $4s^4$ (B) $108s^5$ (C) $729s^6$ (D) $2916s^8$
- 7 The solubility product of a salt having general formula MX₂, in water is : 4×10^{-12} . The concentration of M²⁺ ions in the aqueous solution of the salt is -
 (A) $1.0 \times 10^{-4}M$ (B) $2.0 \times 10^{-6}M$
 (C) $4.0 \times 10^{-10}M$ (D) $1.6 \times 10^{-4}M$
- 8 The mass of CO₂ that must be mixed with 20 g of oxygen such that 27 ml of a sample of the resulting mixture contains equal number of molecules of each gas
 (A) 13.75 g (B) 27.5 g (C) 41.25 g (D) 55 g
- 9 A liquid is in equilibrium with its vapours at boiling point. On the average the molecules in two phases have same
 (A) Intermolecular forces (B) Kinetic energy (C) Total energy (D) Potential energy
- 10 STATEMENT - 1
 Greater the value of van der Waal's constant 'a' greater is the liquification of the gas.
 STATEMENT - 2
 'a' directly measures the magnitude of attractive forces between the molecules.
 (A) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for Statement - 1.
 (B) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1.
 (C) Statement - 1 is True, Statement - 2 is False.
 (D) Statement - 1 is False, Statement - 2 is True.
- 11 If HA + NaOH → NaA + H₂O ΔH = - 12 kcal and HB + NaOH → NaB + H₂O ΔH = -11 kcal then equimolar solution of which acid has higher pH-
 (A) HA (B) HB
 (C) both have same pH (D) information insufficient
- 12 The buffer solution of 100 ml having a pH value 4 when added to 1 ml dilute HCl, then the pH of buffer solution
 (A) Converts to 7 (B) Does not change (C) Converts to 2 (D) Changes to 10
- 13 What fraction of an indicator HIn is in the basic form at a pH of 6 if pK_a of the indicator is 5 ?
 (A) $\frac{1}{2}$ (B) $\frac{1}{11}$
 (C) $\frac{10}{11}$ (D) $\frac{1}{10}$
- 14 Dissociation constant of mono basic acids A, B, C and D are 6×10^{-4} , 5×10^{-5} , 3.6×10^{-6} and 7×10^{-10} respectively. The pH values of their 0.1M aqueous solution are in the order
 (A) D > C > B > A (B) A > B > C > D (C) D > C > A > B (D) NONE
- 15 A 50 ml sample of a hydrogen-oxygen mixture was placed in a gas burette at 18°C and confined at 1 atm. A spark was passed through the sample so that the formation of water could go to completion. The resulting pure gas had a volume of 10 ml at atmospheric pressure. The initial mole fraction of hydrogen in the mixture would be
 (A) 0.734 (B) 0.534. (C) 0.734 or 0.534 (D) can't be predicted.

- 16 1 litre flask contains nitrogen along with a drop or two of water at 40° C, the total pressure being 760 Torr. If all the contents are transferred to another flask of 0.5L at the same temperature. The pressure setup in the second flask will be (aqueous tension at 40o C=55 torr)
- (A) 1410 torr (B) 1465 torr
(C) 1520 torr (D) 1540 torr
- 17 A volume V of a gas at a temperature T₁ and a pressure P is enclosed in a sphere. It is connected to another sphere of volume V/2 by a tube and stopcock. The second sphere is initially evacuated and the stopcock is close. If the stopcock is opened the temperature of the gas in the second sphere becomes T₂. The first sphere is maintained at a temperature T₁. What is the final pressure P₁ within the apparatus?
- (A) $\frac{2PT_2}{2T_2 + T_1}$ (B) $\frac{2PT_2}{T_2 + 2T_1}$ (C) $\frac{PT_2}{2T_2 + T_1}$ (D) $\frac{PT_2}{2T_2 + T_1}$
- 18 What is the equilibrium constant expression for the reaction
 $P_4(s) + 5O_2(g) \rightleftharpoons P_4O_{10}(s)$
- (A) $K_c = [O_2]^5$ (B) $K_c = [P_4O_{10}]/[P_4][O_2]^5$
(C) $K_c = 1/[O_2]^5$ (D) None of these
- 19 The solubility products of Al(OH)₃ and Zn(OH)₂ are 8.5×10^{-23} and 1.8×10^{-14} at room temperature. If the solution contains Al³⁺ and Zn²⁺ ions, the ion first precipitated by adding NH₄OH is -
- (A) Al³⁺ (B) Zn²⁺ (C) both (D) none
- 20 Assuming 100% ionization, which will have maximum pH?
- (A) 0.01M NH₄Cl (B) 0.01M(NH₄)₂SO₄ (C) 0.01M (NH₄)₃PO₄ (D) equal
- 21 The Lassaigne's extract is boiled with conc. HNO₃ while testing for halogens. By doing so it:
- (A) increases the concentration of NO₃⁻ ions (B) decomposes Na₂S and NaCN, if formed
(C) helps in the precipitation of AgCl (D) increases the solubility product of AgCl
- 22 At which of the following four conditions, the density of an ideal gas will be maximum?
- (A) 273 K and 1 atm (B) 273 K and 2 atm
(C) 546 K and 1 atm (D) 546 K and 2 atm
- 23 If for two gases of molecular weights M_A and M_B at temperature T_A and T_B, T_AM_B = T_BM_A, then which property has the same magnitude for both the gases.
- (A) density (B) pressure (C) KE per mol (D) V_{rms}
- 24 A gas at a pressure of 5.0 atm is heated from 0° to 546°C and simultaneously compressed to one-third of its original volume. Hence final pressure is:
- (A) 10.0 atm (B) 30.0 atm (C) 45.0 atm (D) 5.0 atm

25

A solution which is 10^{-3} M each in Mn^{2+} , Fe^{2+} , Zn^{2+} and Hg^{2+} is treated with 10^{-16} M sulphide ion. If K_{sp} of MnS , FeS , ZnS and HgS are 10^{-15} , 10^{-23} , 10^{-20} and 10^{-54} respectively which one will precipitate first:

- (A) FeS (B) MgS
 (C) HgS (D) ZnS

26 The solubility products of $Al(OH)_3$ and $Zn(OH)_2$ are 8.5×10^{-23} and 1.8×10^{-14} respectively. If NH_4OH is added to a solution containing Al^{3+} and Zn^{2+} ions, then substance precipitated first is:

- (A) $Al(OH)_3$ (B) $Zn(OH)_2$
 (C) Both together (D) None at all

27

The solubility product of $BaCrO_4$ is $2.4 \times 10^{-10} M^2$. The maximum concentration of $Ba(NO_3)_2$ possible without precipitation in a $6 \times 10^{-4} M K_2CrO_4$ solution is-

- (A) $4 \times 10^{-7} M$ (B) $1.2 \times 10^{10} M$
 (C) $6 \times 10^{-4} M$ (D) $3 \times 10^{-4} M$

28

A solution with $pH = 2$ is more acidic than the one with $pH = 6$ by a factor of

- (A) 3 (B) 4
 (C) 3000 (D)

29

Dry ice is solid carbon dioxide. A 0.050g sample of dry ice is placed in an evacuated 4.6 L vessel at $30^\circ C$. Calculate the pressure inside the vessel after all the dry ice has been converted to CO_2 gas.

- (A) 6.14 atm (B) 0.614 atm
 (C) 0.0614 atm (D) 6.14×10^{-3} atm

30

Which of the following represents the avogadro number

- (A) Number of molecules present in 1 L of gas at N.T.P. (B) Number of molecules present in 22.4 ml of gas at N.T.P.
 (C) Number of molecules present in 22.4 L of gas at 298K and 1 atm. pressure (D) Number of molecules present in one mole of gas at any temp. and pressure

31

Which of the following will shift the reaction $PCl_3 + Cl_2 \rightleftharpoons PCl_5$ to the left side :

- [1] Addition of PCl_5 [2] Increase in pressure
 [3] Decrease in temperature [4] Catalyst

- (A) (A) (B) (B)
 (C) (C) (D) (D)

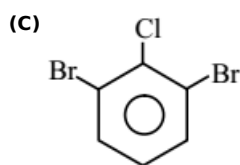
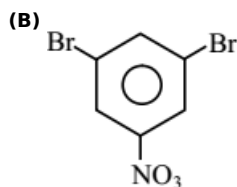
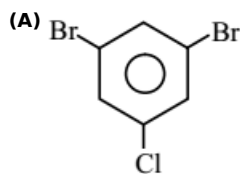
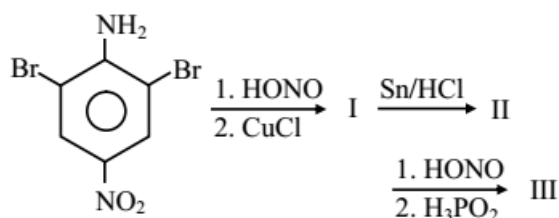
32

The solubility in water of a sparingly soluble salt AB_2 is $1.0 \times 10^{-5} mol L^{-1}$. Its solubility product will be

- (A) 1×10^{-15} (B) 1×10^{-10}
 (C) 4×10^{-15} (D) 4×10^{-10}

33

निम्न अभिक्रिया अनुक्रम में प्राप्त अंतिम उत्पाद (III) है



(D) इनमें से कोई नहीं

34 100 mL solution of pH = 6 is diluted to 1000 mL. Resulting solution has pH :

(A) 7.0

(B) 6.79

(C) 7.3

(D) 6.40

35 The addition of solid sodium carbonate to pure water causes

(A) An increase in the hydronium ion concentration

(B) An increase in p^H

(C) No change in p^H

(D) A decrease in the hydroxide ion concentration

36 A gas causes heating effect when allowed to expand at room temperature, it shows heating effect because

(A) a gas high critical temperature

(B) a gas has inversion temperature much below room temperature

(C) a gas has inversion temperature above room temperature

(D) a gas has high intermolecular forces of attraction

37 500 mL of nitrogen at 27°C is cooled to -5°C at the same pressure. The new volume becomes

(A) 326.32 mL

(B) 446.66 mL

(C) 546.32 mL

(D) 771.56 mL

38 How much should the pressure be increased in order to decrease the volume of a gas by 5% at a constant temperature?

(A) 5%

(B) 5.26%

(C) 10%

(D) 4.26%

39 The temperature of a sample of gas is raised from 127°C to 527°C . The average kinetic energy of the gas.

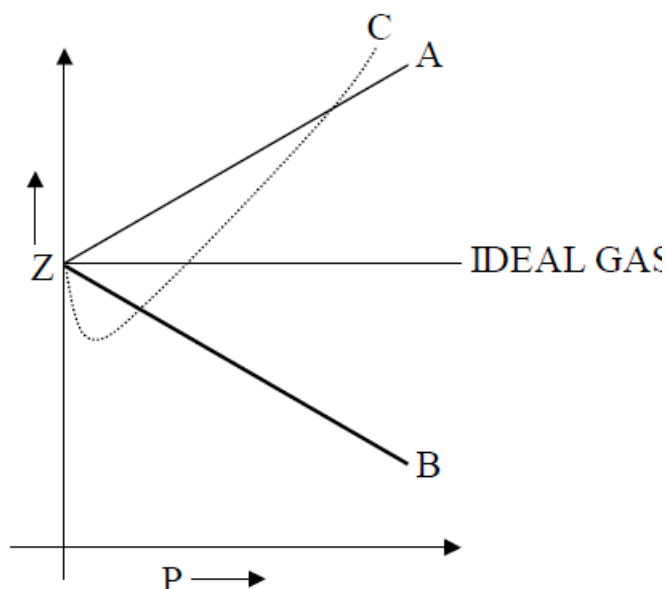
(A) Does not change

(B) Is doubled

(C) Is halved

(D) Can not be calculated

- 40 Among the following, the alkene on ozonolysis giving rise to only one aldehyde as the product is:
- (A) 1-Butene (B) Propane
(C) 2-Butene (D) 2-Methylprop-1-ene.
- 41 Which of the following expressions is/are not true ?
- (A) $[H^+] = [OH^-] = \sqrt{K_w}$ for a neutral solution at all temperatures (B) $[H^+] > \sqrt{K_w}$ & $[OH^-] < \sqrt{K_w}$ for an acidic solution
(C) $[H^+] < \sqrt{K_w}$ & $[OH^-] > \sqrt{K_w}$ for an alkaline solution (D) $[H^+] = [OH^-] = 10^{-7} M$ for neutral solution at all temperatures
- 42 Which of the following not function as buffer solution?
- (A) NaOH + NH₄OH (B) NaH₂PO₄ + Na₂HPO₄ (C) Borax + boric acid (D) CH₃COOH + CH₃COONa
- 43 The equilibrium constant, K_p for the reaction,
 $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ is 1.6 at 200°C
 The pressure at which PCl₅ will be 50% dissociated at 200°C is
- (A) 3.2 atm (B) 4.8 atm
(C) 2.4 atm (D) 6.4 atm
- 44 The pK_a of a weak acid (HA) is 4.5. The pOH of an aqueous buffered solution of HA, in which 50% of the acid is ionized, is :
- (A) 9.5 (B) 7.0
(C) 4.5 (D) 2.5
- 45 In acidic medium phenolphthalein exists in the form of
- (A) Benzenoid (B) quinonoid (C) anion (D) none of these
- 46 At 27°C a sample of ammonia gas exerts a pressure of 5.3 atm. What is the pressure when the volume of the gas is reduced to one-tenth of the original value at the same temperature?
- (A) 0.53 atm (B) 5.3 atm
(C) 53 atm (D) None of these



where $Z = \frac{PV}{nRT}$,

a = Van der Waal's constant for pressure correction

b = Van der Waal's constant for volume correction

Pick the only incorrect statement

- (A) for gas A, if $a = 0$, the compressibility factor is directly proportional to pressure
- (B) for gas B, if $b = 0$, the compressibility factor is directly proportional to pressure.
- (C) for gas C, $a \neq 0$, $b \neq 0$, it can be used to calculate a and b by giving lowest P value and its intercept with $Z = 1$
- (D) slope for all three gases at high pressure is positive.

- 48 **A flask containing 12 g of a gas of relative molecular mass 120 at a pressure of 100 atm was evacuated by means of a pump until the pressure was 0.01 atm. Which of the following is the best estimate of the number of molecules left in the flask**

$(N_0 = 6 \times 10^{23} \text{ mol}^{-1})$.

- (A) 6×10^{19} (B) 6×10^{18} (C) 6×10^7 (D) 6×10^{13}

49

Which will make basic buffer?

- (A) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NaOH
- (B) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M CH_3COOH
- (C) 100 mL of 0.1 M CH_3COOH + 100 mL of 0.1 M NaOH
- (D) 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH_4OH

50

if the concentration of C at equilibrium is increased by a factor of 2, it will cause the equilibrium concentration of B to change to

In a system $\text{A(s)} \rightleftharpoons 2\text{B(g)} + 3\text{C(g)}$,

- (A) Two times the original value
- (B) One half of its original value
- (C) $2\sqrt{2}$ times the original value
- (D) $\frac{1}{2\sqrt{2}}$ times the original value

- 51 **The pH of 10^{-8} M HCl is**

- (A) 8 (B) 6 (C) Between 6 and 7 (D) Between 7 and 8.

- 52 The solubility of sparingly soluble substance AgCl can be increased by the addition of
- (A) aq. NH₃ (B) aq. NaCN (C) Both a and b (D) None of these
- 53 Which of the following solution will have pH close to 1?
- (A) 100 ml of $\frac{N}{10}$ HCl + 45 ml of $\frac{N}{10}$ NaOH (B) 55 ml of $\frac{M}{10}$ HCl + 45 ml of $\frac{M}{10}$ NaOH (C) 10 ml of $\frac{N}{10}$ HCl + 90 ml of $\frac{M}{10}$ NaOH (D) 75 ml of $\frac{M}{5}$ HCl + 25 ml of $\frac{M}{5}$ NaOH
- 54 Chlorex which is a good solvent for aromatic impurities is:
- (A) dichlorodimethyl ether (B) dichlorodiethyl ether
(C) monochloro ether (D) diethyl ether
- 55 The solubility of Fe(OH)₃ would be maximum in-
- (A) 0.1 M NaOH (B) 0.1 M HCl
(C) 0.1 M KOH (D) 0.1 M H₂SO₄
- 56 The correct order of increasing [H₃O⁺] in the following aqueous solution is -
- (A) 0.001 M H₂S < 0.01 M H₂SO₄ < 0.01 M NaCl < 0.01 M NaNO₂ < 0.01 M NaNO₂ < 0.01 M NaCl < 0.01 M H₂S < 0.01 M NaCl < 0.01 M NaNO₂ < 0.01 M H₂SO₄ < 0.01 M H₂S < 0.01 M H₂SO₄ < 0.01 M NaNO₂ < 0.01 M H₂SO₄
(B) 0.01 M NaCl < 0.01 M NaNO₂ < 0.01 M H₂S < 0.01 M H₂SO₄
(C) 0.01 M NaNO₂ < 0.01 M NaCl < 0.01 M H₂S < 0.01 M H₂SO₄
(D) 0.01 M H₂S < 0.01 M NaCl < 0.01 M NaNO₂ < 0.01 M H₂SO₄
- 57 STATEMENT - 1
He and H₂ always show positive deviation at 0°C in PV vs P graph.
STATEMENT - 2
Boyle temperature of both these gases are much below than 0°C.
- (A) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for Statement - 1.
(B) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1.
(C) Statement - 1 is True, Statement - 2 is False.
(D) Statement - 1 is False, Statement - 2 is True.
- 58 At STP, a container has 1 mole of Ar, 2 moles of CO₂, 3 moles of O₂ and 4 moles of N₂. Without changing the total pressure if one mole of O₂ is removed, the partial pressure of O₂ :
- (A) is changed by about 26 % (B) is halved (C) is unchanged (D) changed by 33 %
- 59 If for two gases of molecular weights M_A and M_B at temperature T_A and T_B, T_AM_B = T_BM_A, then which property has the same magnitude for both the gases :
- (A) density (B) pressure (C) K. E. per mole (D) r.m.s. speed
- 60 A weak acid, HA, has a K_a of 1.00 × 10⁻⁵. If 0.100 mol of this acid is dissolved in one litre of water, the percentage of acid dissociated at equilibrium is closest to
- (A) 1.00% (B) 99.9%
(C) 0.100% (D) 99.0%

- 61 Statement-1: Aqueous solution of FeCl_3 is acidic.**
Statement-2 : FeCl_3 hydrolysis in water to form acidic solution
- (A) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is a correct explanation for STATEMENT-1
- (B) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
- (C) STATEMENT-1 is True, STATEMENT-2 is False
- (D) STATEMENT-1 is False, STATEMENT-2 is True
- 62 The pH of 0.016 M NaOH solution is**
- (A) 1.796
- (B) 12.204
- (C) 11
- (D) None of these
- 63 Dissociation constant of two acids HA & HB are respectively 4×10^{-10} & 1.8×10^{-5} whose pH value will be higher for a given molarity:**
- (A) HA
- (B) HB
- (C) Both same
- (D) Can't say
- 64 STATEMENT - 1**
A mixture of the solutions of a weak acid and its sodium salt acts as a buffer solution.
STATEMENT - 2
The pH of the solution does not change substantially when small amount of acid or base is added to the buffer.
- (A) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for Statement - 1.
- (B) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1.
- (C) Statement - 1 is True, Statement - 2 is False.
- (D) Statement - 1 is False, Statement - 2 is True.
- 65 For the reaction, $[\text{Ag}(\text{CN})_2]^- \rightleftharpoons \text{Ag}^+ + 2\text{CN}^-$, the equilibrium constant at 25° is 4×10^{-19} . If a solution is 0.1 M in KCN and 0.03 M in AgNO_3 originally, at equilibrium, the concentration of Ag^+ is**
- (A) 7.5×10^{-16} M
- (B) 7.5×10^{-18} M
- (C) 1.25×10^{-19} M
- (D) 1.25×10^{-17} M
- 66 pH of a mixture which is 0.1 M in CH_3COOH and 0.05 M in $(\text{CH}_3\text{COO})_2\text{Ba}$ is [pK_a of $\text{CH}_3\text{COOH} = 4.74$]**
- (A) 4.74
- (B) 5.04
- (C) 4.44
- (D) 7.00
- 67 10 gm of a gas at 1 atm and 273 K occupies 5 litres. The temperature at which the volume becomes double for the same mass of gas at the same pressure is:**
- (A) 273 K
- (B) -273°C
- (C) 273°C
- (D) 546°C
- 68 Equal weights of ethane and hydrogen are mixed in an empty container at 25°C . Total pressure exerted by hydrogen is :**
- (A) 162
- (B) 1 : 1
- (C) 1 : 16
- (D) 15 : 16
- 69 Dipole-induced dipole interactions are present in which of the following pairs?**
- (A) HCl and He atoms
- (B) SiF_4 and He atoms
- (C) H_2O and alcohol
- (D) Cl_2 and CCl_4

- 70 **STATEMENT - 1**
At an equilibrium $A(g) + 2B(g) \rightleftharpoons C(g)$ if substantial amount of water is added to the mixture and stated that only A(g) gets dissolved to a certain extent in water then equilibrium shifts towards forward direction.
STATEMENT - 2
On decreasing the volume of reaction mixture and keeping rest of things same the equilibrium shifts to a direction having less number of gaseous molecules.
- (A) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for Statement - 1.
 (B) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1.
 (C) Statement - 1 is True, Statement - 2 is False.
 (D) Statement - 1 is False, Statement - 2 is True.
- 71 47. Which of the following is correct option for free expansion of an ideal gas under adiabatic condition?
 (a) $q=0, \Delta T < 0, w \neq 0$
 (b) $q=0, \Delta T \neq 0, w=0$
 (c) $q \neq 0, \Delta T=0, w=0$
 (d) $q=0, \Delta T=0, w=0$
- (A) 1 (B) 2
 (C) 3 (D) 4
- 72 **What is the pH of the resulting solution when equal volumes of 0.1 M NaOH and 0.01 M HCl are mixed?**
- (A) 7.0 (B) 1.04
 (C) 12.65 (D) 2.0
- 73 **The pK_a of acetylsalicylic acid (aspirin) is 3.5. The pH of gastric juice in human stomach is about 2 - 3 and the pH in the small intestine is about 8. Aspirin will be**
- (A) unionised in small intestine and in the stomach
 (B) completely ionised in the small intestine and in the stomach
 (C) ionised to the stomach and almost unionised in the small intestine
 (D) ionised in the small intestine and almost unionised in the stomach
- 74 **In a saturated solution of the sparingly soluble strong electrolyte $AgIO_3$ (molecular mass = 283) the equilibrium which sets in is - $AgIO_3 \rightleftharpoons Ag^+_{(aq)} + IO^-_{3(aq)}$ If the solubility product constant K_{sp} of $AgIO_3$ at a given temperature is 1.0×10^{-8} , what is the mass of $AgIO_3$ contained in 100 ml of its saturated solution ?**
- (A) 28.3×10^{-2} g (B) 2.83×10^{-3} g
 (C) 1.0×10^{-7} g (D) 1.0×10^{-4} g
- 75 **If a solution has a pOH value of 14 at $25^\circ C$, H^+ concentration should be**
- (A) 0 (B) 10
 (C) 1 (D) None of these
- 76 **A certain buffer solution contains equal concentration of X^- and HX . The K_b for X^- is 10^{-10} . The pH of the buffer is**
- (A) 4 (B) 7 (C) 10 (D) 14
- 77 **To determine the value of R, which of the PV value is considered to be equal for every gas at 273 K ?**
- (A) $\lim_{P \rightarrow 1 \text{ atm}} (PV_m)$ (B) $\lim_{P \rightarrow 0} (PV_m)$
 (C) $\lim_{P \rightarrow \infty} (PV_m)$ (D) $\lim_{V \rightarrow 0} (PV_m)$
- 78 **Chemical equilibrium is dynamic in nature because**
- (A) The equilibrium is maintained quickly
 (B) Conc. of reactants and products become same at equilibrium
 (C) Conc. of reactants and products are constant but different
 (D) Both forward and backward reactions occur at all times with same speed

- 79 The critical temperature of a substance is -
- (A) The temperature above which the substance undergoes decomposition
 (B) The temperature above which a substance can exist only as a gas
 (C) Boiling point of the substance
 (D) All are wrong
- 80 A real gas at a very high pressure occupies
- (A) more volume than that of an ideal gas under identical conditions
 (B) less volume than that of an ideal gas under identical conditions
 (C) same volume than that of an ideal gas under identical conditions
 (D) can't predict.
- 81 A cylinder provided with a piston has some PCl_5 which is in equilibrium with PCl_3 and Cl_2 . The system is compressed with the help of piston. Indicate the correct statement :
- (A) some more PCl_5 will decompose
 (B) the system remains unaffected
 (C) PCl_3 and Cl_2 will combine to form PCl_5
 (D) explosion occurs
- 82 0.1 millimole of CdSO_4 are present in 10 mL acid solution of 0.08 N HCl. Now H_2S is passed to precipitate all the Cd^{2+} ions. The pH of the solution after filtering off precipitate, boiling off H_2S and making the solution 100 mL by adding H_2O is-
- (A) 2
 (B) 4
 (C) 6
 (D) 8
- 83 Let K_w at 100°C be $5.5 \times 10^{-13} \text{ M}^2$. If an aqueous solution at this temperature has $\text{pH} = 6.2$. Its nature will be
- (A) acidic
 (B) alkaline
 (C) neutral
 (D) can't say
- 84 The pH of 0.1 M aqueous solutions of the following compounds increases in the order
- (A) $\text{NaCl} < \text{NH}_4\text{Cl} < \text{NaCN} < \text{HCl}$
 (B) $\text{HCl} < \text{NH}_4\text{Cl} < \text{NaCl} < \text{NaCN}$
 (C) $\text{NaCN} < \text{NH}_4\text{Cl} < \text{NaCl} < \text{HCl}$
 (D) $\text{HCl} < \text{NaCl} < \text{NaCN} < \text{NH}_4\text{Cl}$
- 85 What is the hydronium ion concentration of a 0.25 M HA solution? ($K_a = 4 \times 10^{-8}$)
- (A) 10^{-4}
 (B) 10^{-5}
 (C) 10^{-7}
 (D) 10^{-10}
- 86 The ionization constant of ammonium hydroxide is 1.77×10^{-5} at 298 K. Hydrolysis constant of ammonium chloride is
- (A) 6.50×10^{-12}
 (B) 5.65×10^{-13}
 (C) 5.65×10^{-12}
 (D) 5.65×10^{-10}
- 87 The heat of vaporisation of benzene is $7353 \text{ cal mol}^{-1}$. The approximate bpt. of benzene is
- (A) 77.1°C
 (B) 87.1°C
 (C) 101°C
 (D) 95°C
- 88 If 25 ml of 0.25 M NaCl solution is diluted with water to a volume of 500ml. the new concentration of the solution is
- (A) 0.167 M
 (B) 0.0125 M
 (C) 0.833 M
 (D) 0.0167 M
- 89 250 ml of an aqueous solution of glucose contains 9 g of glucose. The molarity of the solution is:
- (A) 0.5
 (B) 0.3
 (C) 0.2
 (D) 0.1

- 90 **Correct order of IE :-**
- (A) Cu > Au < Ag (B) Cu < Ag < Au
(C) Cu > Ag < Au (D) Ag > Cu < Au
- 91 **It is found that 0.1 M solution of three sodium salts NaX, NaY and NaZ gave pH 7.0, 9.0 and 11.0 respectively. The correct order of increasing strength of acid HX, HY, HX is**
- (A) HX < HY < HZ (B) HY < HZ < HX (C) HZ < HY < HX (D) HZ > HY < HX
- 92 **Consider the following statements**
1. Isotonic solutions have the same molar concentration at a given temperature
 2. The molal elevation constant K_b is a characteristic of a solvent, and is independent of the solute added
 3. The freezing point of a 0.1 M aqueous KCl solution is more than that of a 0.1 M aqueous $AlCl_3$ solution.
- Which of these statements is correct?**
- (A) 1 and 2 (B) 2 and 3
(C) 1 and 3 (D) 1, 2 and 3
- 93 **The osmotic pressure of a dilute solution is directly proportional to the**
- (A) Diffusion rate of the solute (B) Ionic concentration
(C) Boiling point (D) Flow of solvent from a concentrated solution
- 94 **12.2 g of benzoic acid (m.w.= 122) in 100 g benzene has depression in freezing point 2.6K; $K_f = 5.2 \text{ K kg/mol}$. If there is 100% polymerization, number of molecules of benzoic acid in associated state is :**
- (A) 1 (B) 2 (C) 3 (D) 4
- 95 **Which of the following is low boiling azeotropic mixture :**
- (A) $CH_3COCH_3 + C_6H_5NH_2$ (B) $H_2O + HCl$
(C) $CHCl_3 + CH_3COOH$ (D) $C_6H_6 + CCl_4$
- 96 **Among the following, that does not form an ideal solution is**
- (A) C_6H_6 and $C_6H_5CH_3$ (B) C_2H_5Cl and C_6H_5OH
(C) C_6H_5Cl and C_6H_5Br (D) C_2H_5Br and C_2H_5I
- 97 **$[H_3O^+]$ in 0.1 M H_2SO_4 at two stages $H_2SO_4 \rightleftharpoons H^+ + HSO_4^-$
 $HSO_4^- \rightleftharpoons H^+ + SO_4^{2-}$ are :**
- (A) 0.1 M, 0.1 M (B) 0.1 M, > 0.01 M (C) > 0.1 M, > 0.1 M (D) 0.1 M, < 0.1 M
- 98 **STATEMENT - 1**
If hydration energy is greater than lattice energy the solid dissolves in liquid.
STATEMENT - 2
The solubility of a solid in liquid depends upon lattice energy and hydration energy.
- (A) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for Statement - 1.
(B) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1.
(C) Statement - 1 is True, Statement - 2 is False.
(D) Statement - 1 is False, Statement - 2 is True.

99 The mineral atacamite (A) is $[\text{CuCl}_2 \cdot x\text{Cu}(\text{OH})_2]$. 45.05 mL of 0.5089 M HCl were required to react completely with 1.6320 g of A. Hence, x is (mol. Wt of A = 427):

- (A) 2 (B) 3 (C) 4 (D) 1

100 When 200g of 10% solution was cooled part of the solute precipitated and the concentration of solution become 6% . The mass of the precipitated solute is

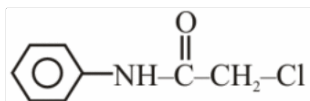
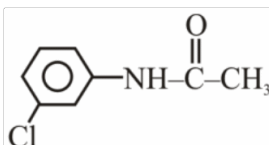
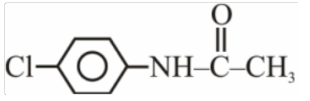
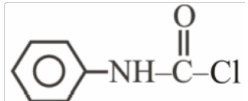
- (A) 6.2 g (B) 8.5 g
(C) 12.6 g (D) 14.0 g

101 5% solution of sucrose is isotonic with 1% solution of a compound 'A' then the molecular weight of compound 'A' is

- (A) 32.4 (B) 68.4
(C) 121.6 (D) 34.2



The major Product A will be :-

- (A)  (B) 
(C)  (D) 

103 एक संकुल यौगिक $[\text{MA}_8]$ के 0.001 मोलल जलीय विलयन का हिमांक -0.0054°C है। मान लो कि यौगिक 100% आयनीकृत होता है और H_2O के लिये $K_f = 1.86 \text{ km}^{-1}$ है। निम्नलिखित में से कौन यौगिक को सही प्रदर्शित कर रहा है।

- (A) $[\text{MA}_8]$ (B) $[\text{MA}_7]\text{A}$
(C) $[\text{MA}_6]\text{A}_2$ (D) $[\text{MA}_5]\text{A}_3$

104 0.06% (w/v) aqueous solution of urea is isotonic with

- (A) 0.6% glucose solution (B) 0.1 M glucose solution
(C) 0.06% glucose solution (D) 0.01 M glucose solution

105 Which of the following salts undergoes hydrolysis?

- (A) CH_3COONa (B) KNO_3
(C) NaCl (D) K_2SO_4

106 The total concentration of dissolved particles inside red blood cells is approximately 0.30 M and the membrane surrounding the cells is semipermeable. What would be the osmotic pressure (in atmosphere) inside the cells become if the cells were removed from the blood plasma and placed in pure water at 298 K?

- (A) 7.34 atm (B) 1.78 atm (C) 2.34 atm (D) 0.74 atm

107 **STATEMENT - 1**
Gold sol is a Lyophobic sol.
STATEMENT - 2
Gold sol is a positive sol.

(A) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is a correct explanation for STATEMENT-1

(C) STATEMENT-1 is True, STATEMENT-2 is False

(B) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is NOT a correct explanation for STATEMENT-1

(D) STATEMENT-1 is False, STATEMENT-2 is True

108 In a mixture of weak acid and its salt with strong base, the ratio of concentration of salt to acid is increased ten times the pH of the solution

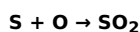
(A) Increases by 10

(B) Decreases by 10

(C) Decreases by 1

(D) Increases by 1.

109 If 96g of sulphur reacts with 32g of oxygen to form sulphur dioxide. Calculate moles of excess reagent left in the reaction



(A) 1 mole

(B) 3 mole

(C) 2 mole

(D) None

110 The molarity of the solution containing 7.1 g of Na_2SO_4 in 100 ml of aqueous solution is

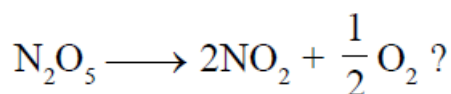
(A) 2 M

(B) 0.5 M

(C) 1 M

(D) 0.05 M

111 What is the activation energy for the decomposition of N_2O_5 as



If the values of the rate constants are 3.45×10^{-5} and 6.9×10^{-3} at $27^\circ C$ and $67^\circ C$ respectively

(A) 102×10^2 kJ

(B) 488.5 kJ

(C) 112 kJ

(D) 112.5 kJ

112 Which of the following is incorrect statement ?

(A) Borax contains the tetrahedral units as $[B_4O_5(OH)_4]^{-2}$

(B) Na_2CO_3 is called soda ash

(C) $B_3N_3H_6$ is known as inorganic benzene

(D) Clear solution of $Ca(OH)_2$ is called milk of lime

113 Adiabatic reversible expansion of a gas is represented by -

(A) $\left(\frac{T_1}{T_2}\right)^\gamma = \left(\frac{P_2}{P_1}\right)^{1-\gamma}$

(B) $\left(\frac{T_1}{T_2}\right) = \left(\frac{P_1}{P_2}\right)^{\frac{\gamma-1}{\gamma}}$

(C) $\left(\frac{T_1}{T_2}\right)^\gamma = \left(\frac{P_1}{P_2}\right)^{\gamma-1}$

(D) All are correct

114 How many electrons can fit in the orbital for which $n = 3$ and $l = 1$?

(A) 2

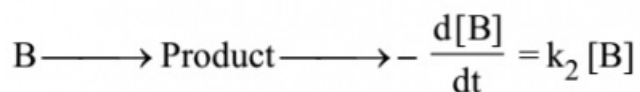
(B) 6

(C) 10

(D) 14

115

Consider following two reactions



Units of k_1 and k_2 are expressed in terms of molarity (mol L^{-1}) and time (sec^{-1}) as –

- (A) $\text{sec}^{-1}, \text{M sec}^{-1}$ (B) $\text{M sec}^{-1}, \text{M sec}^{-1}$ (C) $\text{sec}^{-1}, \text{M}^{-1} \text{sec}^{-1}$ (D) $\text{M sec}^{-1}, \text{sec}^{-1}$

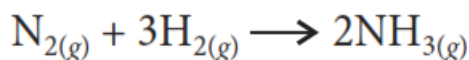
116

For a first order reaction $A \longrightarrow P$, the temperature (T) dependent rate constant (k) was found to follow the equation $\log k = - (2000) 1/T + 6.0$. The preexponential factor A and the activation energy E_a , respectively, are

- (A) $1.0 \times 10^6 \text{ s}^{-1}$ and 9.2 kJ mol^{-1} (B) 6.0 s^{-1} and 16.6 kJ mol^{-1} (C) $1.0 \times 10^6 \text{ s}^{-1}$ and 16.6 kJ mol^{-1} (D) $1.0 \times 10^6 \text{ s}^{-1}$ and 38.3 kJ mol^{-1}

117

Consider the reaction :



The equality relationship between

$$\frac{d[\text{NH}_3]}{dt} \text{ and } -\frac{d[\text{H}_2]}{dt} \text{ is}$$

- (A) $\frac{d[\text{NH}_3]}{dt} = -\frac{d[\text{H}_2]}{dt}$ (B) $\frac{d[\text{NH}_3]}{dt} = -\frac{1}{3} \frac{d[\text{H}_2]}{dt}$
- (C) $+\frac{d[\text{NH}_3]}{dt} = -\frac{2}{3} \frac{d[\text{H}_2]}{dt}$ (D) $+\frac{d[\text{NH}_3]}{dt} = -\frac{3}{2} \frac{d[\text{H}_2]}{dt}$

118

The formal charge and P-O bond order in PO_4^{3-} respectively are

- (A) 0.6, -0.75 (B) -0.75, 1.25
(C) 1.0, -0.75 (D) 1.25, -3

119

The isotope used to remove the brain tumours and treatment of cancer is

- (A) U-235 (B) Na-24
(C) Iodine (D) C0-60

120

In a zero-order reaction for every 10° rise of temperature, the rate is doubled. If the temperature is increased from 10°C to 100°C , the rate of reaction will become

- (A) 64 times (B) 128 times
(C) 256 times (D) 512 times

121

Which one of the following series contains electrophiles only :

(A) H_2O , SO_3 , H_3O^+ (B) NH_3 , H_2O , AlCl_3 (C) AlCl_3 , SO_3 , NO_2^+ (D) H_2O , Cl^+ , NH_3

122

The correct difference between first and second order reactions is that

(A) the rate of a first-order reaction does not depend on reactant concentrations; the rate of a second-order reaction does depend on reactant concentrations

(B) the half-life of a first-order reaction does not depend on $[A]_0$; the half-life of a second-order reaction does depend on $[A]_0$

(C) a first-order reaction can be catalysed; a second-order reaction cannot be catalysed

(D) the rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations.

123

If the equilibrium constant for a reaction is 10, then the value of ΔG° will be ($R = 8\text{JK}^{-1}\text{mol}^{-1}$, $T = 300\text{K}$)

(A) $+5.527\text{KJ mol}^{-1}$ (B) -5.527KJ mol^{-1} (C) $+55.27\text{KJ mol}^{-1}$ (D) -55.27KJ mol^{-1}

124

The number of unpaired electrons in Cu^+

(A) 1

(B) 2

(C) 0

(D) 3

125

i) $E_a = 15\text{kJ mol}^{-1}$; $\Delta H = -70\text{kJ mol}^{-1}$ ii) $E_a = 30\text{kJ mol}^{-1}$; $\Delta H = -15\text{kJ mol}^{-1}$ iii) $E_a = 60\text{kJ mol}^{-1}$; $\Delta H = +20\text{kJ mol}^{-1}$
If above reactions are at same frequency factor then fastest and slowest reactions are

(A) 'iii' is fastest, 'ii' is slowest

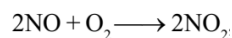
(B) 'i' is fastest, 'iii' is slowest

(C) 'ii' is fastest, 'iii' is slowest

(D) 'iii' is fastest, 'i' is slowest

126

The rate of the simple reaction



when the volume of the reaction vessel is doubled-

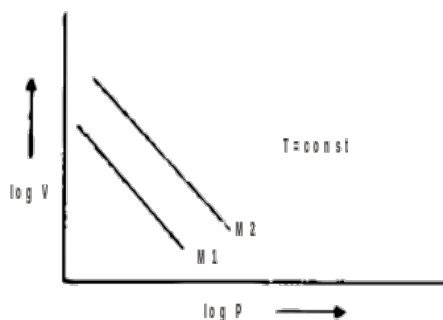
(A) will grow eight times of its initial rate

(B) rate reduce to one-eights of its initial rate

(C) will grow four times of its initial rate

(D) reduce to one-fourth of its initial rate

127



For same mass of two different ideal gases of molecular weights M_1 and M_2 .

Plots of $\log V$ vs $\log P$ at a given constant temperature are shown. Identify the correct option :

- (A) $M_1 > M_2$ (B) $M_1 = M_2$
 (C) $M_1 < M_2$ (D) can be predicted only if temperature is known

128 STATEMENT - 1

The value of n for a line in Balmer series of hydrogen spectrum having the highest wavelength 4 and 6

STATEMENT - 2

For Balmer series of hydrogen spectrum the value of n_1 is 2 and n_2 is 3,4,5 etc.

- (A) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for Statement - 1. (B) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1. (C) Statement - 1 is True, Statement - 2 is False. (D) Statement - 1 is False, Statement - 2 is True.

129 What is the value of angular momentum of an electron revolving inside H-atom with an energy - 3.4 eV

- (A) $2.1 \times 10^{-34} \text{ Js}^{-1}$ (B) $21 \times 10^{-34} \text{ Js}^{-1}$ (C) $5.2 \times 10^{-34} \text{ Js}^{-1}$ (D) $52 \times 10^{-34} \text{ Js}^{-1}$

130 For homogeneous gas reaction $4\text{NH}_3 + 5\text{O}_2 \rightleftharpoons 4\text{NO} + 6\text{H}_2\text{O}$. The equilibrium constant K_c has the unit of -

- (A) (concentration)₁ (B) (concentration)₋₁
 (C) (concentration)₉ (D) (concentration)₁₀

131 Which of the following rate law has an overall order of 0.5 for reaction involving substances X, Y and Z?

- (A) rate = $K(C_X)(C_Y)(C_Z)$ (B) rate = $K(C_X)^{0.5}(C_Y)^{0.5}(C_Z)^{0.5}$ (C) rate = $K(C_X)^{1.5}(C_Y)^{-1}(C_Z)^0$ (D) rate = $K(C_X)(C_Z)^{0.5}/(C_Y)^2$

132 For hypothetical reversible

$1/2\text{A}_2(\text{g}) + 3/2\text{B}_2(\text{g}) \rightarrow \text{AB}_3(\text{g}); \Delta H = -20\text{KJ}$ if standard entropies of A_2, B_2 and AB_3 are 60, 40 and 50 JK^{-1} respectively. The above reaction will be in equilibrium at -

- (A) 400 K (B) 500 K
 (C) 250 K (D) 200 K

133 The first use of quantum theory to explain the structure of atom was made by

- (A) Heisenberg (B) Bohr
 (C) Thomson (D) Einstein.

134 Which one of the following molecules contain no π -bond?

- (A) CO_2 (B) H_2O
 (C) SO_2 (D) NO_2

135 Consider an endothermic reaction $X \rightarrow Y$ with the activation energies E_b and E_f for the backward and forward reactions, respectively.

In general

(A) $E_b < E_f$

(B) $E_b > E_f$

(C) $E_b = E_f$

(D) no definite relation

136 STATEMENT - 1

The Arrhenius equation explains the temperature dependence of rate of a chemical reaction.

STATEMENT - 2

Plots of $\log K$ versus $1/T$ are linear and the energy of activation is obtained from such plots.

(A)

Statement - 1 is True,
Statement - 2 is True;
Statement - 2 is a correct
explanation for Statement - 1.

(B)

Statement - 1 is True,
Statement - 2 is True;
Statement - 2 is NOT a correct
explanation for Statement - 1.

(C)

Statement - 1 is True,
Statement - 2 is False.

(D)

Statement - 1 is False,
Statement - 2 is True.

137 STATEMENT - 1

Instantaneous rate of reaction is equal to dx/dt

STATEMENT - 2

It is the rate of reaction at any particular instant of time.

(A)

Statement - 1 is True,
Statement - 2 is True;
Statement - 2 is a correct
explanation for Statement - 1.

(B)

Statement - 1 is True,
Statement - 2 is True;
Statement - 2 is NOT a correct
explanation for Statement - 1.

(C)

Statement - 1 is True,
Statement - 2 is False.

(D)

Statement - 1 is False,
Statement - 2 is True.

138 Five moles of an ideal gas at 1 bar and 298 K is expanded into vacuum to double the volume. The work done is :

(A) zero

(B) $C_V(T_2 - T_1)$

(C) $-RT(V_2 - V_1)$

(D) $-RT \ln V_2/V_1$

139

STATEMENT - 1

$\frac{1}{\lambda} = R_H Z^2 \left[\frac{1}{n_1^2} - \frac{1}{n_2^2} \right]$ can be used to determine the wavelength of an electron in an orbit.

STATEMENT - 2

Wavelength associated with an electron is given by $\lambda = \frac{h}{\sqrt{2mKE}}$

(A)

Statement - 1 is True,
Statement - 2 is True;
Statement - 2 is a correct
explanation for Statement - 1.

(B)

Statement - 1 is True,
Statement - 2 is True;
Statement - 2 is NOT a correct
explanation for Statement - 1.

(C)

Statement - 1 is True,
Statement - 2 is False.

(D)

Statement - 1 is False,
Statement - 2 is True.

140 The quantum number which specifies the location as well as energy is

(A) principal quantum number

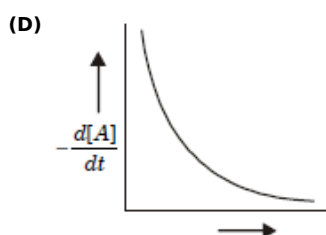
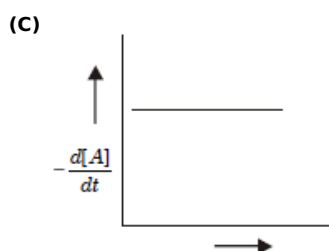
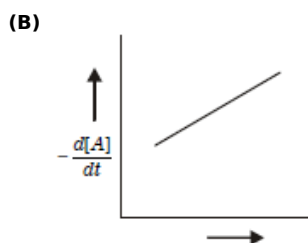
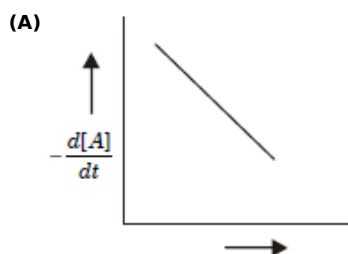
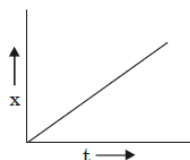
(B) azimuthal quantum number

(C) spin quantum number

(D) magnetic quantum number

The graph between $-\frac{d[A]}{dt}$ and time will be of the type

time 't' for A → B is given below



142 Rate of reaction can be expressed by Arrhenius equation as $k = Ae^{-E/RT}$, In this equation, E represents

(A) the energy below which colliding molecules will not react

(B) the total energy of the reacting molecule at a temperature, T

(C) the fraction of molecules with energy greater than the activation energy of the reaction

(D) the energy above which all the colliding molecules will react

143

Statement-I : Down the group solubility of IIA group hydroxides increases

Statement-II : Down the group in IIA group hydroxides, decrease in lattice enthalpy is more than decrease in hydration enthalpy

(A) I and II are true

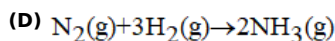
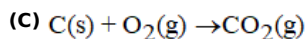
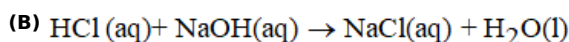
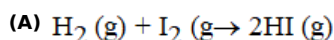
(B) I and II are false

(C) I is true, II is false

(D) I is false, II is true

144

For which of the following change $\Delta H \neq \Delta E$?



145

In the reaction $CS_2(l) + 3O_2(g) \rightarrow CO_2(g) + 2SO_2(g)$ $\Delta H = -265$ kcal

The enthalpies of formation of CO_2 and SO_2 are both negative and are in the ratio 4 : 3. The enthalpy of formation of CS_2 is +26 kcal/mol. Calculate the enthalpy of formation of SO_2 .

(A) -90 kcal/mol

(B) -52 kcal/mol

(C) -78 kcal/mol

(D) -71.7 kcal/mol

146

Radiation of $\lambda = 155$ nm was irradiated on Li (work function = 5eV) plate. The stopping potential (in eV) is.

(A) 3eV

(B) 4eV

(C) 0.3eV

(D) 0.5 eV

147

A mole of N_2H_4 loses ten moles of electrons to form a new compound Y. Assuming that all the nitrogen appears in the new compound, what is the oxidation state of nitrogen in Y? (there is no change in the oxidation number of hydrogen)

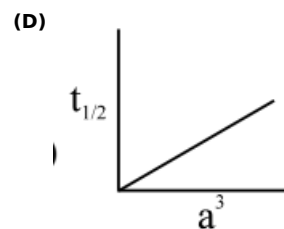
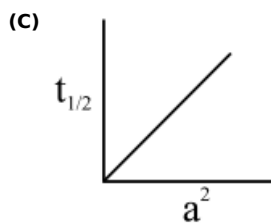
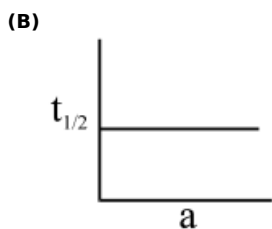
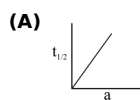
(A) -1

(B) -3

(C) +3

(D) +5

148 Which of the following curves represents a 1st order reaction :



149 A sample of radioactive element undergoes 90% decomposition in 366 minutes. Its $t_{0.5}$ in minutes is

(A) $(\ln 2 / \ln 10) \times 366$

(B) $1/366$

(C) $(\ln 2 / \ln 90) \times 366$

(D) 183

150 Given that standard heat enthalpy of CH_4 , C_2H_4 and C_3H_8 are - 17.9, 12.5, -24.8 Kcal/mol. The ΔH for $\text{CH}_4 + \text{C}_2\text{H}_4 \rightarrow \text{C}_3\text{H}_8$ is -

(A) -55.2 Kcal

(B) -30.2 Kcal

(C) 55.2 Kcal

(D) -19.4 Kcal

151 How many electrons fit in the orbital for which $n = 3$ and $l = 1$?

(A) 2

(B) 6

(C) 10

(D) 14

152 The number of electrons emitted is

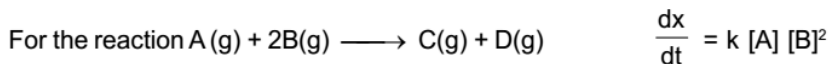
(A) proportional to the intensity of the incident radiation

(B) proportional to the frequency of the incident radiation

(C) proportional to the product of intensity and frequency of incident radiation

(D) none of these

153



Initial pressure of A and B are respectively 0.60 atm and 0.80 atm. At a time when pressure of C is 0.20 atm, rate of the reaction, relative to the initial value is :

(A) $\frac{1}{6}$

(B) $\frac{1}{48}$

(C) $\frac{1}{4}$

(D) $\frac{1}{24}$

154 Two radioactive elements X and Y have half lives of 50 and 100 minute respectively. Initial sample of both the elements have same no. of atoms. The ratio of the remaining number of atoms of X and Y after 200 minute is:

(A) 2

(B) 1/2

(C) 4

(D) 1/4

155 $3\text{A} \rightarrow 2\text{B}$, rate of reaction $\frac{+d[\text{B}]}{dt}$ is equal to

(A) $-\frac{3}{2} \frac{d[\text{A}]}{dt}$

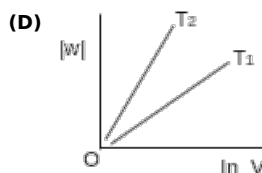
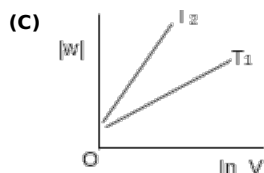
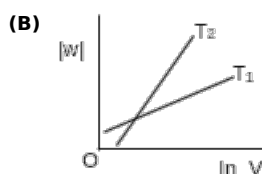
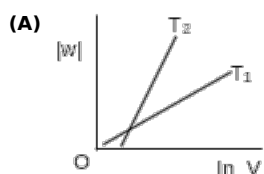
(B) $-\frac{2}{3} \frac{d[\text{A}]}{dt}$

(C) $-\frac{1}{3} \frac{d[\text{A}]}{dt}$

(D) $+2 \frac{d[\text{A}]}{dt}$

156

Consider the reversible isothermal expansion of an ideal gas in a closed system at two different temperatures T_1 and T_2 ($T_1 < T_2$). The correct graphical depiction of the dependence of work done (w) on the final volume (V) is :



157

The correct relationship between free energy change in a reaction and the corresponding equilibrium constant K_c is -

(A) $\Delta G^\circ = RT \ln K_c$

(B) $-\Delta G^\circ = RT \ln K_c$

(C) $\Delta G = RT \ln K_c$

(D) $-\Delta G = RT \ln K_c$

158

If uncertainty in position and momentum are equal, then uncertainty in velocity is

(A) $\frac{1}{m} \sqrt{\frac{h}{\pi}}$

(B) $\sqrt{\frac{h}{\pi}}$

(C) $\frac{1}{2m} \sqrt{\frac{h}{\pi}}$

(D) $\sqrt{\frac{h}{2\pi}}$

159 The rate of reaction was found to be equal to its rate constant at any concentration of the reactant. The order of the reaction is

(A) zero order

(B) first order

(C) second order

(D) third order

160 For the first order opposed by first order reaction ; $k_f = 9 \times 10^{-3} \text{ min}^{-1}$ and $k_b = 2 \times 10^{-3} \text{ min}^{-1}$

If we start with the concentration of A equal to 1 (M) what will be concentration of B in $10^3/11$ mins ?

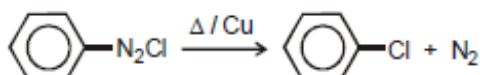
(A) 0.818 (M)

(B) 0.409 (M)

(C) 0.517(M)

(D) 0.190 (M)

161



Half-life is independent of conc. of A. After 10 minutes volume of N_2 gas is 10 L and after complete reaction volume is 50 L. Hence rate constant in min^{-1} :

(A) $(2.303/10) \log 5$

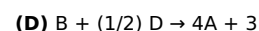
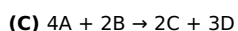
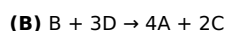
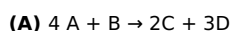
(B) $(2.303/10) \log 1.25$

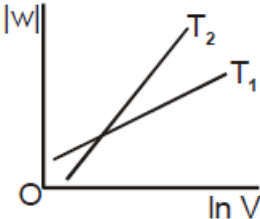
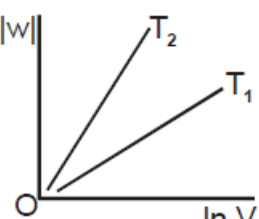
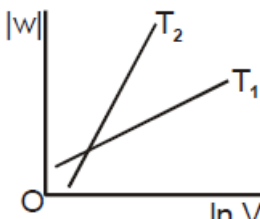
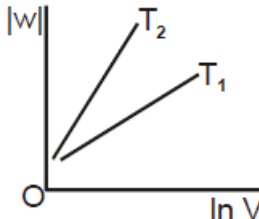
(C) $(2.303/10) \log 2$

(D) $(2.303/10) \log 4$

162 The rate of a reaction is expressed in different ways as follows ;

$+ 1/2(d[C]/dt) = - 1/3 (d[D]/dt) = + 1/4 (d[A]/dt) = - (d[B]/dt)$ The reaction is :



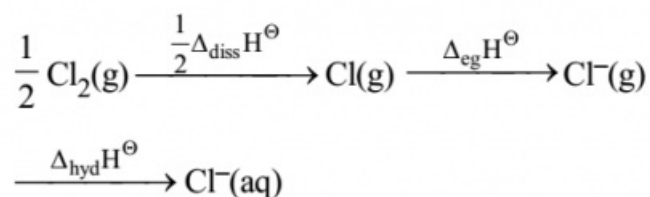
- 163 The variation of equilibrium constant with temperature is given below :
Temperature Equilibrium Constant
 $T_1 = 250\text{C}$ $K_1 = 10$
 $T_2 = 1000\text{C}$ $K_2 = 100$
 The value of ΔH_0 , ΔG_0 at T_1 and ΔG_0 at T_2 (in Kj mol^{-1}) respectively, are close to [use $R = 8.314\text{JK}^{-1}\text{mol}^{-1}$]
- (A) 28.4, -7.14 and -5.71 (B) 0.64, -7.14 and -5.71
 (C) 28.4, -5.71 and -14.29 (D) 0.64, -5.71 and -14.29
- 164 A hydrogen like species with atomic number Z is in higher energy level "n" and emits photons of energy 25.7 and 8.7 eV when makes a transition to 1st and 2nd excited state respectively. Determine "n"?
- (A) 4 (B) 5 (C) 3 (D) 2
- 165 The maximum number of 3d-electrons having spin quantum number, $s = +\frac{1}{2}$ is :
- (A) 10 (B) 5
 (C) 2 (D) 1
- 166 Read the following statements :
 (i) Peroxisomes are involved in photorespiration of the non-green cell of plants and also perform β -oxidation of fatty acids in animal cells
 (ii) Mitochondria possess enzymes for the β -oxidation of fatty acids
 (iii) The fluid-dynamic mosaic model of plasma membrane explains both structural and functional aspects
 (iv) The movement of cilia and flagella is due to the presence of dynein proteins (V) Lysosomes originate from Golgi
 How many of the above statements are correct ?
- (A) Two (B) Three
 (C) Four (D) Five
- 167 The significance of quantisation is going to be lost as
- (A) The energy difference between consecutive energy levels are going to decrease. (B) When we move from lower energy level to higher energy level, energy levels are trying to converge into a single line (C) Both (a) and (b) (D) None
- 168 In an atom two electrons move around the nucleus in circular orbits of radii R & 4R. The ratio of the time taken by them to complete one revolution is :
- (A) 1 : 4 (B) 4 : 1 (C) 1 : 8 (D) 8 : 7
- 169 यदि 100 मोल H_2O_2 , 1 bar तथा 300 K पर अपघटित होती है तो 1 bar दाब के विरुद्ध प्रसारित होने पर एक मोल $\text{O}_2(\text{g})$ द्वारा किया गया कार्य (kJ) होगा :
- $$2\text{H}_2\text{O}_2(\text{l}) \rightleftharpoons 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g})$$
- ($R = 8.3\text{ J K}^{-1}\text{ mol}^{-1}$)
- (A) 498.00 (B) 62.25 (C) 124.50 (D) 249.00
- 170 Consider the reversible isothermal expansion of an ideal gas in a closed system at two different temperatures T_1 and T_2 ($T_1 < T_2$). The correct graphical depiction of the dependence of work done (w) on the final volume (V) is
- (A)  (B)  (C)  (D) 

- 171 The electrons identified by quantum numbers n and l : i) $n = 4, l = 1$ ii) $n = 4, l = 0$
 iii) $n = 3, l = 2$ iv) $n = 3, l = 1$ can be placed in order of increasing energy as
- (A) $iii < iv < ii < i$ (B) $iv < ii < iii < i$
 (C) $ii < iv < i < iii$ (D) $i < iii < ii < iv$

172 The correct option for free expansion of an ideal gas under adiabatic condition is

- (A) $q = 0, \Delta T = 0$ and $w = 0$ (B) $q = 0, \Delta T < 0$ and $w > 0$
 (C) $q < 0, \Delta T = 0$ and $w = 0$ (D) $q > 0, \Delta T > 0$ and $w > 0$

173 Oxidising power of chlorine in aqueous solution can be determined by the parameters indicated below :



The energy involved in the conversion of $\frac{1}{2} \text{Cl}_2(\text{g})$ to $\text{Cl}^\ominus(\text{aq})$

(Using the data, $\Delta_{\text{diss}} H^\ominus_{\text{Cl}_2} = 240 \text{ kJ mol}^{-1}$, $\Delta_{\text{eg}} H^\ominus_{\text{Cl}} = -349 \text{ kJ mol}^{-1}$, $\Delta_{\text{hyd}} H^\ominus_{\text{Cl}^\ominus} = -381 \text{ kJ mol}^{-1}$) will be

- (A) -610 kJ mol^{-1} (B) -850 kJ mol^{-1} (C) $+120 \text{ kJ mol}^{-1}$ (D) $+152 \text{ kJ mol}^{-1}$

174 The electronic configuration of chlorine is

- (A) 2,7 (B) 2,8,8,7
 (C) 2,8,7 (D) 2,7,8

175 A Carnot engine takes $3 \times 10^6 \text{ cal.}$ of heat from a reservoir at 627°C , and gives it to a sink at 27°C . The work done by the engine is -

- (A) $8.4 \times 10^6 \text{ J}$ (B) $16.8 \times 10^6 \text{ J}$ (C) Zero (D) $4.2 \times 10^6 \text{ J}$

176 Bond order normally gives idea of stability of a molecular species. All the molecules viz. H_2 , Li_2 and B_2 have the same bond order yet they are not equally stable. Their stability order is

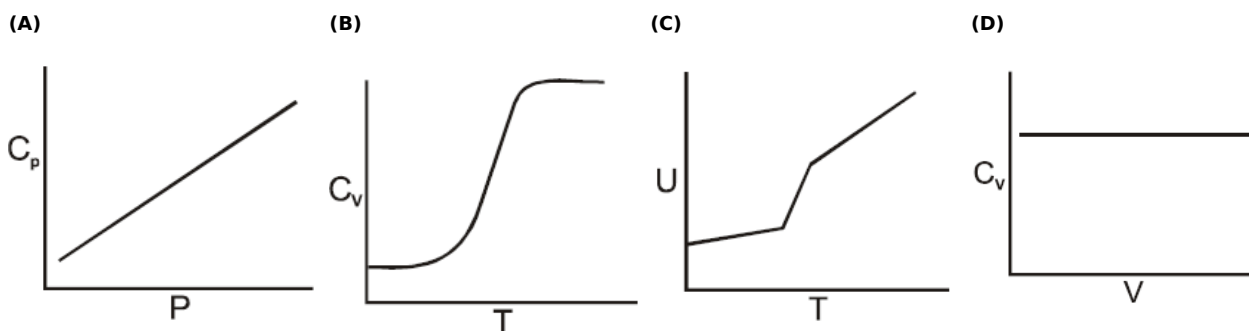
- (A) $\text{H}_2 > \text{B}_2 > \text{Li}_2$ (B) $\text{Li}_2 > \text{H}_2 > \text{B}_2$
 (C) $\text{Li}_2 > \text{B}_2 > \text{H}_2$ (D) $\text{H}_2 > \text{Li}_2 > \text{B}_2$

177 The standard heat of combustion of Al is $-837.8 \text{ kJ mol}^{-1}$ at 25°C . If Al reacts with O_2 at 25°C , which of the following releases 250 kcal of heat ?

- (A) the reaction of 0.624 mol of Al (B) the formation of 0.624 mol of Al_2O_3
 (C) the reaction of 0.312 mol of Al (D) the formation of 0.150 mol of Al_2O_3

- 178 The value of $\log_{10} K$ for a reaction $A \rightarrow B$ is
 (Given $\Delta H_{r, 298 K}^{\circ} = -54.07 \text{ kJ mol}^{-1}$,
 $\Delta S_{r, 298 K}^{\circ} = 10 \text{ JK}^{-1}\text{mol}^{-1}$ and
 $R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$, $2.303 \times 8.314 \times 298 = 5705$)
- (A) 5 (B) 10
 (C) 95 (D) 100
- 179 Plutonium decays with a half-life of 24000 years. If plutonium is stored for 72000 years, the fraction of it that remains is
- (A) $\frac{1}{2}$ (B) $\frac{1}{3}$
 (C) $\frac{1}{4}$ (D) $\frac{1}{8}$
- 180 Find the work done when 2 mole of hydrogen expand isothermally from 15 to 50 litres against a constant pressure of 1 atm at 25°C.
- (A) 847.0 cal (B) 847 K cal
 (C) 84.7 cal (D) 84.7 K cal
- 181 In which of the following process work is done by surrounding
- (A) $\text{H}_2\text{O}(s) \rightarrow \text{H}_2\text{O}(\ell)$ (B) $\text{H}_2\text{O}(\ell) \rightarrow \text{H}_2\text{O}(g)$ (C) $2\text{A}(g) \rightarrow 3\text{B}(g) + \text{C}(g)$ (D) $\text{PCl}_5(g) \rightarrow \text{PCl}_3(g) + \text{Cl}_2(g)$
- 182 Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region?
- (A) Brackett series (B) Lyman series
 (C) Balmer series (D) Paschen series
- 183 If the series limit of wavelength of the Lyman series for the H-atom is 912Å, then the series limit of wavelength for the Balmer series of the H-atom is
- (A) 912Å (B) $912 \times 2\text{Å}$ (C) $912 \times 4\text{Å}$ (D) $\frac{912}{2}\text{Å}$
- 184 Which of the following set of quantum numbers belong to highest energy ?
- (A) $n = 4, l = 0, m = 0, s = +\frac{1}{2}$ (B) $n = 3, l = 0, m = 0, s = +\frac{1}{2}$
 (C) $n = 3, l = 1, m = 1, s = +\frac{1}{2}$ (D) $n = 3, l = 2, m = 1, s = +\frac{1}{2}$
- 185 One mole of an ideal gas at 300 K in thermal contact with surroundings expands isothermally from 1.0 L to 2.0 L against a constant pressure of 3.0 atm. In this process, the change in entropy of surroundings (ΔS_{surr}) in JK^{-1} is
 (1 L atm = 101.3 J)
- (A) 5.763 (B) 1.013
 (C) -1.013 (D) -5.763

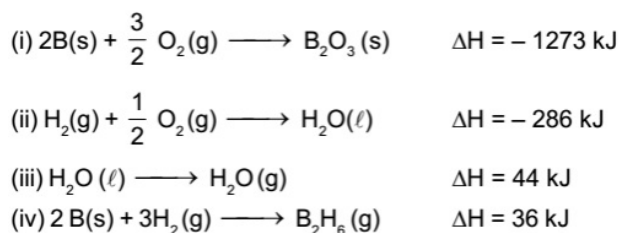
186 For a diatomic ideal gas in a closed system, which of the following plots does not correctly describe the relation between various thermodynamic quantities?



187 Which of the following sets of the four quantum numbers, n , l , m and m_s describes one of the outermost electrons in a ground state magnesium atom?

- (A) $3, 1, 1, \frac{1}{2}$ (B) $3, 0, 0, -\frac{1}{2}$ (C) $3, 0, 1, \frac{1}{2}$ (D) $3, 1, 0, \frac{1}{2}$

188 Calculate the value of ΔH_c° for diborane (B_2H_6) from the following data:



- (A) -2035 kJ/mol (B) -1991 kJ/mol
 (C) -2079 kJ/mol (D) -1273 kJ/mol

189 For the reaction, $A+B \rightleftharpoons C+D$, $K_c = 9$. If A and B are taken in equal amounts, then amount of C at equilibrium is :-

- (A) 1 (B) 0.25
 (C) 0.75 (D) None of these

190 Given the data below, what approximately is ΔH for the reaction: $H_2(g) + C_2H_4(g) \rightleftharpoons C_2H_6(g)$. Average Bond energies H—H—436 kJ/mole, Cl—Cl—242 kJ/mole, H—Cl—432 kJ/mole

- (A) +186 kJ / mole (B) -186 kJ /mole (C) -246 kJ/mole (D) +246 kJ/mole

191 The value of Planck's constant is $6.63 \times 10^{-34} \text{ J s}$. The velocity of light is $3.0 \times 10^8 \text{ m s}^{-1}$. Which value is closest to the wavelength in nanometers of a quantum of light with frequency of $8 \times 10^{15} \text{ s}^{-1}$?

- (A) 2×10^{-25} (B) 5×10^{-18}
 (C) 4×10^1 (D) 3×10^7

192 The energy required to break one mole of Cl-Cl bonds in Cl_2 is 242 kJ mol^{-1} . The longest wavelength of light capable of breaking a single Cl - Cl bond is

($c = 3 \times 10^8 \text{ ms}^{-1}$ and $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)

- (A) 594 nm (B) 640 nm
 (C) 700 nm (D) 494 nm

- 193 Two moles of an ideal gas ($C_v = \frac{5}{2}R$) was compressed adiabatically against constant pressure of 2 atm. Which was initially at 350 K and 1 atm pressure. The work involve in the process is equal to
 (A) 250 R (B) 300 R (C) 400 R (D) 500 R
- 194 1 mole of an ideal monoatomic gas initially at 300 K, pressure P and volume V in a closed adiabatic vessel fitted with a movable piston is suddenly compressed by placing a weight on the piston. The gas pressure is increased to 2P. What is the raise in temperature (ΔT) for adiabatic process?
 (A) 100 (B) 120 (C) 150 (D) 300
- 195 Which electronic level would allow the hydrogen atom to absorb a photon but not to emit a photon?
 (A) 3s (B) 2p (C) 2s (D) 1s
- 196 The relation between pressure P and volume V is given by $PV^{\frac{1}{4}} = \text{constant}$.
 If the percentage decrease in volume is $\frac{1}{4}$, then the approximate percentage increase in pressure is
 (A) $\frac{1}{16}$ (B) $\frac{1}{4}$
 (C) $\frac{1}{8}$ (D) $\frac{1}{2}$
- 197 Two elements X (at-mass 16) and Y (at-mass 14) combine to form compounds A, B and C. The ratio of different masses of Y which combines with a fixed mass of X in A, B and C is 1 : 3 : 5. If 32 parts by mass of X combines with 84 parts by mass of Y in B, then in C 16 parts by mass of X will combine with :
 (A) 14 parts by mass of Y (B) 42 parts by mass of Y
 (C) 70 parts by mass of Y (D) 84 parts by mass of Y
- 198 The quantum numbers of most energetic electron in Ne atom when it is in first excited state is
 (A) 2, 1, 0, $\pm 1/2$ (B) 3, 1, 1, $\pm 1/2$ (C) 3, 0, 0, $\pm 1/2$ (D) 3, 1, 0, $\pm 1/2$.
- 199 The empirical formula of an acid is CH_2O_2 , the probable molecular formula of acid may be:-
 (A) CH_2O (B) CH_2O_2
 (C) $\text{C}_2\text{H}_4\text{O}_2$ (D) $\text{C}_3\text{H}_6\text{O}_4$
- 200 Under isothermal conditions, a gas at 300 K expands from 0.1 L to 0.25 L against a constant external pressure of 2 bar. The work done by the gas is [Given that 1 L bar = 100 J]
 (A) 30 J (B) -30 J
 (C) 5 KJ (D) 25 J