**ACTIVE SITE TUTORIALS**

**Date :** 20-08-2019 **TEST ID: 524**

**Time :** 17:36:00 **CHEMISTRY**

**Marks :** 1074

6.THERMODYNAMICS

**Single Correct Answer Type**

| 1. | Energy can transfer from system to surroundings as work if | | | | | | | |
|  | a) | There is thermal equilibrium between system and surrounding | | | | | | | |
|  | b) | There is mechanical equilibrium between system and surrounding | | | | | | | |
|  | c) | If pressure of system > atmospheric pressure | | | | | | | |
|  | d) | None of these | | | | | | | |
| 2. | Temperature of 1 of a gas is increased by at constant pressure. The work done is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 3. | Carnot’s cycle is said to have 25% efficiency when it operates between (source) and 300 K (sink). Temperature is | | | | | | | |
|  | a) | 300 K | b) | 350 K | c) | 375 K | d) | 400 K |
| 4. | Since the enthalpy of elements in their natural state is taken to be zero, the heat of formation of compounds | | | | | | | |
|  | a) | Is always negative | | | b) | Is always positive | | |
|  | c) | May be negative or positive | | | d) | Is zero | | |
| 5. | The dissolution of in water is endothermic even through dissolves in water spontaneously. Which one of the following best explains this behaviour? | | | | | | | |
|  | a) | The bonds on solid are weak | | | | | | | |
|  | b) | The entropy-driving force causes dissolution | | | | | | | |
|  | c) | Endothermic processes are energetically favourable | | | | | | | |
|  | d) | The dissolving process is unrelated to energy | | | | | | | |
| 6. | Under which of the following condition is the relation valid for a closed system at | | | | | | | |
|  | a) | Constant pressure | | | | | | | |
|  | b) | Constant temperature | | | | | | | |
|  | c) | Constant temperature and pressure | | | | | | | |
|  | d) | Constant temperature, pressure and composition | | | | | | | |
| 7. | When a reaction is carried out in a closed vessel | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 8. | The products of combustion of an aliphatic thiol (RSH) at 298 K are | | | | | | | |
|  | a) | , and | | | b) | , and | | |
|  | c) | , and | | | d) | , and | | |
| 9. | For an endothermic reaction where represents the enthalpy of the reaction in , the minimum value for the energy of activation will be | | | | | | | |
|  | a) | Less than | b) | Zero | c) | More than | d) | Equal to |
| 10. | For the gaseous reaction involving the complete combustion of isobutene | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 11. | If  Then the enthalpy of formation of at 298 K is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 12. | The products of combustion of an aliphatic thiol (RSH) at 298 K are | | | | | | | |
|  | a) | and | | | b) | , and | | |
|  | c) | , and | | | d) | , and | | |
| 13. | For hypothetical reversible reaction  if standard entropies of and are 60, 40, and 50, respectively. The above reaction will be equilibrium at | | | | | | | |
|  | a) | 400 K | b) | 500 K | c) | 250 K | d) | 200 K |
| 14. | . This is | | | | | | | |
|  | a) | Change in KE | | | | | | | |
|  | b) | Change in rotational energy | | | | | | | |
|  | c) | Work done which system can do on expanding the gas per per degree increase in temperature | | | | | | | |
|  | d) | All correct | | | | | | | |
| 15. | For which of the following equations, will be equal to ? | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 16. | A reaction, , is found to have a positive entropy change, the reaction will be: | | | | | | | |
|  | a) | Possible at high temperature | | | b) | Possible only at low temperature | | |
|  | c) | Not possible at any temperature | | | d) | Possible at any temperature | | |
| 17. | For the combustion reaction at 298 K  Which of the following alternatives is correct? | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | and bear no relation with each other | | |
| 18. | Enthalpy of the system is given as | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 19. | In thermodynamics, a process is called reversible when | | | | | | | |
|  | a) | The surroundings and system change into each other | | | | | | | |
|  | b) | There is no boundary between the system and surroundings | | | | | | | |
|  | c) | The surroundings are always in equilibrium with the system | | | | | | | |
|  | d) | The system changes into the surroundings spontaneously | | | | | | | |
| 20. | For the reversible process, the value of is given by the expression | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 21. | Which is not intensive property? | | | | | | | |
|  | a) | Boiling point | b) | Refractive index | c) | Molarity | d) | Volume |
| 22. | Which one of the following statements is false? | | | | | | | |
|  | a) | Work is a state function | | | | | | | |
|  | b) | Temperature is a state function | | | | | | | |
|  | c) | Change in the state is completely defined when the initial and final states are specified | | | | | | | |
|  | d) | Work appears at the boundary of the system | | | | | | | |
| 23. | The for andare, and, respectively. The standard enthalpy change (in ) for the reaction  is | | | | | | | |
|  | a) | 524.1 | b) | +41.2 | c) |  | d) |  |
| 24. | If of , and is and respectively. Then bond dissociation energy of bond is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 25. | The difference between the heats of reaction at constant pressure and constant volume for the reaction  at in kJ is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 26. | The heat of hydrogenation of ethane is and that of benzene is  Hence resonance energy of benzene is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 27. | The relationship between the free energy change and entropy change at constant temperature is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 28. | Molar heat capacity of water in equilibrium with ice at constant pressure is | | | | | | | |
|  | a) | Zero | b) | Infinity | c) |  | d) |  |
| 29. | kcal  kcal  From the above data, the standard heat of formation of in kcal is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 30. | If a gas absorbs 200 J of heat and expands by against a constant pressure of , then the change in internal energy is | | | | | | | |
|  | a) | J | b) | J | c) | +100 J | d) | +300 J |
| 31. | Which of the following reaction is endothermic? | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 32. | Entropy of system depends upon | | | | | | | |
|  | a) | Volume only | | | b) | Temperature only | | |
|  | c) | Pressure only | | | d) | Pressure, volume, and temperature | | |
| 33. | When one mole of monoatomic ideal gas at *T* K undergoes adiabatic change under a constant external pressure of 1 atm changes volume from 1 L to 2 L. The final temperature in Kelvin would be | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 34. | Latent heat of vaporization of water liquid into water vapour = , then (heat of formation of liquid water) is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 35. | Evaporation of water is | | | | | | | |
|  | a) | An exothermic change | | | | | | | |
|  | b) | An endothermic change | | | | | | | |
|  | c) | A process where no heat changes occur | | | | | | | |
|  | d) | A process accompanied by chemical reaction | | | | | | | |
| 36. | In thermodynamics, a process is called reversible when | | | | | | | |
|  | a) | The surroundings and the system change into each other | | | | | | | |
|  | b) | There is no boundary between the system and the surroundings | | | | | | | |
|  | c) | The surroundings are always in equilibrium with the system | | | | | | | |
|  | d) | The system changes into the surroundings spontaneously | | | | | | | |
| 37. | Which of the following equations corresponds to the enthalpy of combustion at 298 K? | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 38. | If a certain mass of gas is made to undergo separately adiabatic and isothermal expansions to the same pressure, starting from the same initial conditions of temperature and pressure, then, as compared to that of isothermal expansion, in the case of adiabatic expansion, the final | | | | | | | |
|  | a) | Volume and temperature will be higher | | | | | | | |
|  | b) | Volume and temperature will be lower | | | | | | | |
|  | c) | Temperature will be lower but the final volume will be higher | | | | | | | |
|  | d) | Volume will be lower but the final volume will be higher | | | | | | | |
| 39. | Which of the following is an endothermic reaction? | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 40. | The expression is true at all | | | | | | | |
|  | a) | Temperatures | | | b) | Pressures | | |
|  | c) | Temperatures and pressures | | | d) | Temperatures and pressure conditions | | |
| 41. | 1 mol of gas at is expanded under adiabatic condition to make volume 8 times . Final temperature and work done, respectively, are | | | | | | | |
|  | a) | 150 K, 900 cal | b) | 150 K, 400 cal | c) | 250 K, 1000 cal | d) | 200 K, 800 cal |
| 42. | Which of the following equations corresponds to the definition of enthalpy of formation at 298 K? | | | | | | | |
|  | a) | (graphite)+ | | | b) | (diamond) | | |
|  | c) | (graphite) | | | d) | (graphite) | | |
| 43. | Heat of neutralization of with all strong acid is . The heat released on neutralization of with HF (weak acid)is of ionization of is | | | | | | | |
|  | a) | 3.0 kcal | b) | kcal | c) | 6.0 kcal | d) | 0.3 kcal |
| 44. | Inversion temperature is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 45. | and of neutralization is , then the heat of formation of  is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 46. | For the gaseous reaction: | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 47. | boiling point= 50 K. What is the boiling point at 10 atm | | | | | | | |
|  | a) | K | b) | K | c) | K | d) | None is correct |
| 48. | The heat of neutralization of oxalic acid is using strong base, . Hence, the enthalpy change of the process is  is | | | | | | | |
|  | a) | 2.0 kcal | b) | kcal | c) | 1.0 kcal | d) | kcal |
| 49. | For the process, at 273 K | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 50. | For an endothermic reaction where represents the enthalpy of the reaction in , the minimum value for the energy of the activation will be | | | | | | | |
|  | a) | Less than | b) | Zero | c) | More than | d) | Equal to |
| 51. | Standard molar enthalpy of formation of is equal to | | | | | | | |
|  | a) | Zero | | | | | | | |
|  | b) | The standard molar enthalpy of combustion of gaseous carbon | | | | | | | |
|  | c) | The sum of standard molar enthalpies of formation of and | | | | | | | |
|  | d) | The standard molar enthalpy of combustion of carbon (graphite) | | | | | | | |
| 52. | The molar enthalpies of combustion of C(graphite)andare, and , respectively. The standard enthalpy of formation of is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 53. | The standard heat of combustion of isat. If Al reacts with at , which of the following release 250 kJ of heat? | | | | | | | |
|  | a) | The reaction of 0.624 mol of | | | b) | The formation of 0.624 mol of | | |
|  | c) | The reaction of 0.312 mol of | | | d) | The formation of 0.150 mol of | | |
| 54. | The enthalpy of formation of hypothetical is and for is. What is the enthalpy of the disproportionation of | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 55. | At equilibrium state | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | Unpredictable |
| 56. | The relationship between enthalpy and internal energy change is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 57. | Enthalpy change of a reaction will be equal to | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 58. | For the given reactions  It may be concluded that | | | | | | | |
|  | a) | will attack andwill not | | | b) | will attack andwill not | | |
|  | c) | and both attack | | | d) | None attack | | |
| 59. | The word ‘standard’ in standard molar enthalpy change implies | | | | | | | |
|  | a) | Temperature 298 K | | | b) | Pressure | | |
|  | c) | Temperature 298 K and pressure | | | d) | All temperatures and all pressures | | |
| 60. | Which law of thermodynamic, introduces the concept of entropy | | | | | | | |
|  | a) | First law | b) | Zeroth law | c) | Third law | d) | Second law |
| 61. | In which of the following process and are of same magnitude | | | | | | | |
|  | a) | Evaporation of | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 62. | 1 g gas STP is expanded so that the volume is doubled. Hence, work done is | | | | | | | |
|  | a) | - | b) | - | c) | - | d) | - |
| 63. | For the equations  C(diamond)  Predict whether | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 64. | For the reaction  at  Hence, is | | | | | | | |
|  | a) | 2.7 kcal | b) | kcal | c) | 9.3 kcal | d) | kcal |
| 65. | If and then variation of EMF of a cell , with temperature , is given by: | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 66. | For an ideal gas Joule-Thomson coefficient is | | | | | | | |
|  | a) | Positive | | | b) | Negative | | |
|  | c) | Zero | | | d) | Dependent on molecular weight | | |

**Multiple Correct Answers Type**

| 67. | Which of the following type of energies are involved in Born Haber’s cycle? | | | | | | | |
|  | a) |  | | | b) | Ionization energy | | |
|  | c) | Bond dissociation energy | | | d) | Lattice energy | | |
| 68. | The correct expressions for an adiabatic process are | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 69. | The heat of combustion of enthanol was determined in a bomb calorimeter and was found to be at 25°. What will be for the same reaction at 298K? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 70. | In which of the following cases entropy increases? | | | | | | | |
|  | a) | Solid changing to liquid | | | | | | | |
|  | b) | Expansion of a gas | | | | | | | |
|  | c) | Crystals dissolve | | | | | | | |
|  | d) | Boiling of an egg | | | | | | | |
| 71. | Which of the following statements is/are correct? | | | | | | | |
|  | a) | The entropy of the universe decreases and increases at a periodic rate | | | | | | | |
|  | b) | The entropy of the universe increases and tends towards the maximum value | | | | | | | |
|  | c) | For endothermic spontaneous processes the total entropy change decreases | | | | | | | |
|  | d) | The entropy of the universe decreases and tends to zero | | | | | | | |
| 72. | Which of the following are extensive properties? | | | | | | | |
|  | a) | Elevation in boiling point | | | b) | Boiling point | | |
|  | c) | Emf of cell | | | d) | of cell | | |
| 73. | The heat of neutralization of a strong acid by a strong base is a constant because : | | | | | | | |
|  | a) | The strong acid and strong base react completely | | | | | | | |
|  | b) | The strong acid and strong base dissociate completely and only and ions react in every case | | | | | | | |
|  | c) | The salt formed do not hydrolyse | | | | | | | |
|  | d) | There is no side reaction during neutralization | | | | | | | |
| 74. | In the isothermal expansion of an ideal gas: | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 75. | Which one is not correct for a cyclic process as shown in the figure? | | | | | | | |
|  | a) |  | b) |  | c) | 314 J | d) | 31.4 J |
| 76. | Identify the intensive quantities from the following | | | | | | | |
|  | a) | Enthalpy | b) | Temperature | c) | Volume | d) | Refractive index |
| 77. | Which of the following affect the heat of reaction? | | | | | | | |
|  | a) | Physical states of reactants and products | | | | | | | |
|  | b) | Allotropic forms of elements | | | | | | | |
|  | c) | Temperature | | | | | | | |
|  | d) | Reaction carried out at constant pressure or constant volume | | | | | | | |
| 78. | In which of the following reactions, ? | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 79. | The criteria for sponaeity of a process is/are | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 80. | Identify the intensive quantities from the following | | | | | | | |
|  | a) | Enthalpy | b) | Temperature | c) | Volume | d) | Refractive index |
| 81. | For an ideal gas undergoing isothermal irreversible expansion | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 82. | The enthalpy of formation of is 22 kcal and that of is 128 kcal . The bond energy of the bond is 37.0 kcal . The bond dissociation energy of is/are : | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 83. | The correct relationship is/are : | | | | | | | |
|  | a) | Kirchhoff’s equation : | b) | Kirchhoff’s equation : | c) |  | d) |  |
| 84. | Which is not correct relationship? | | | | | | | |
|  | a) |  | | | b) | (for ideal gas) | | |
|  | c) | (for ideal gas) | | | d) | All of these | | |
| 85. | For gaseous reactions, if is the change in enthalpy and that in internal energy, then | | | | | | | |
|  | a) | is always greater than | | | | | | | |
|  | b) | is always less than | | | | | | | |
|  | c) | only if the number of mole of the products is less than that of the reactants | | | | | | | |
|  | d) | only if the number of mole of the reactants is less than that of the products | | | | | | | |
| 86. | The intensive property/properties is/are | | | | | | | |
|  | a) | Temperature | b) | Pressure | c) | Internal energy | d) | Heat capacity |
| 87. | Select the correct statement | | | | | | | |
|  | a) | There is a natural asymmetry between converting work to heat and converting heat to work | | | | | | | |
|  | b) | No process is possible in which the sole result is the absorption of heat from a reservoir and its complete conversion into work | | | | | | | |
|  | c) | For every chemical reaction at equilibrium, standard change in Gibbs free energy is zero | | | | | | | |
|  | d) | At constant temperature and pressure, chemical reactions are spontaneous in the direction of decreasing Gibbs energy | | | | | | | |
| 88. | Three identical adiabatic containers have helium, neon and oxygen gases at the same pressure. The gases are compressed to half their original volume. Under these conditions | | | | | | | |
|  | a) | The final temperature of both helium and neon is same | | | | | | | |
|  | b) | The final pressure of the gas in each container is same | | | | | | | |
|  | c) | The final temperature of the gas in each container is same | | | | | | | |
|  | d) | The final pressure of both helium and neon is same | | | | | | | |
| 89. | Which is intensive property? | | | | | | | |
|  | a) | Mass | b) | Mass/volume | c) | Volume | d) | Volume/mass |
| 90. | In which of the following entropy increases? | | | | | | | |
|  | a) | Rusting of iron | | | b) | Melting of ice | | |
|  | c) | Crystallization of sugar from solution | | | d) | Vaporization of camphor | | |
| 91. | In which reaction(s), is negative? | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 92. | For the adiabatic expansion of an ideal gas | | | | | | | |
|  | a) | constant | b) | constant | c) | constant | d) | None of the above |
| 93. | For which process does holds true? | | | | | | | |
|  | a) | Cyclic process | b) | Isothermal expansion | c) | Isochoric process | d) | Adiabatic process |
| 94. | Which of the following statements is/are correct? | | | | | | | |
|  | a) | The evaporation of water is an endothermic change | | | | | | | |
|  | b) | The conversion of white phosphorus to red phosphorus to red phosphorus is an exothermic reaction | | | | | | | |
|  | c) | The heat of neutralization of a strong acid with a strong base is always the same | | | | | | | |
|  | d) | is negative for endothermic reactions | | | | | | | |
| 95. | For which of the following substances is the heat of formation in the standard state zero? | | | | | | | |
|  | a) | Sugar | b) |  | c) | Zinc | d) |  |
| 96. | The standard heat of formation of a compound is the: | | | | | | | |
|  | a) | Change in enthalpy for the production of 1 mole of the compound at STP | | | | | | | |
|  | b) | Change in enthalpy for the formation of 1 mole of the compound form its elements | | | | | | | |
|  | c) | Change in enthalpy for the formation of 1 mole of the compound form its elements at 298 K and 1 atmospheric pressure | | | | | | | |
|  | d) | Change in enthalpy for the formation of 1 mole of the compound form its elements at 25°C and a pressure of 760 mm of Hg. | | | | | | | |
| 97. | In which of the following cases, do you consider the increase in entropy take(s) place? | | | | | | | |
|  | a) | Pure liquid or liquid solutions are formed from solids | | | | | | | |
|  | b) | Gases are formed, either from solids or liquids | | | | | | | |
|  | c) | The number of molecules of gases increase in the course of a chemical reaction | | | | | | | |
|  | d) | The temperature of a substance is increased | | | | | | | |
| 98. | Which of the following statements is/are correct? | | | | | | | |
|  | a) | The heat of neutralization of a strong acid with a strong base is always the same | | | | | | | |
|  | b) | The enthalpy of combustion is always negative | | | | | | | |
|  | c) | A spontaneous change involves a lowering of free energy | | | | | | | |
|  | d) | The enthalpy of an element in the standard state assumed to be unity at 298 K. | | | | | | | |
| 99. | In which of the following cases is the reaction spontaneous at all temperatures? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 100. | The internal energy of an ideal gas decreases by the same amount as the work done by the system: | | | | | | | |
|  | a) | The process must be adiabatic | | | | | | | |
|  | b) | The process must be isothermal | | | | | | | |
|  | c) | The process must be isobaric | | | | | | | |
|  | d) | The temperature must decrease | | | | | | | |
| 101. | Which of the following are applicable for a thermochemical equation? It tells: | | | | | | | |
|  | a) | About the physical state of reactants and products | | | | | | | |
|  | b) | About the allotropic form (if any) of the reactants | | | | | | | |
|  | c) | Whether the reaction is exothermic or endothermic | | | | | | | |
|  | d) | Whether a particular reaction is spontaneous or not | | | | | | | |
| 102. | Which of the following statement is/are correct? | | | | | | | |
|  | a) | Heat, like work is a way of transferring energy | | | | | | | |
|  | b) | Heat is not a property of the system, whereas the temperature is a property of the system | | | | | | | |
|  | c) | Heat is manifested only at the boundary of system and surroundings | | | | | | | |
|  | d) | None of the above | | | | | | | |
| 103. | Among the following, the intensive property is (properties are): | | | | | | | |
|  | a) | Molar conductivity | b) | Electromotive force | c) | Resistance | d) | Heat capacity |
| 104. | The change in enthalpy for an isobaric gaseous reaction (for an ideal gas system) is/are: | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |
| 105. | Which of the following statements are correct? | | | | | | | |
|  | a) | Absolute value of enthalpy cannot be determined | | | | | | | |
|  | b) | Absolute value of internal energy cannot be determined | | | | | | | |
|  | c) | Absolute value of entropy can be determined | | | | | | | |
|  | d) | Internal energy, enthalpy, and entropy are intensive properties | | | | | | | |
| 106. | The standard heat of formation of is s 853.5 kcal and standard heat of the reaction, is The standard, heat of formation of is/are : | | | | | | | |
|  | a) | 1083 kJ | b) | 1102 kJ | c) | 259 kcal | d) | 302 kcal |
| 107. | Which is/are correct for ideal gas? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 108. | The reversible expansion of an ideal gas under adiabatic and isothermal conditions is shown in the figure. Which of the following statement(s) is (are) correct? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 109. | Following enthalpy changes are given:  glucose(s)glucose  glucose(s)glucose  glucose(s)glucose  Calculate enthalpy change in  glucose(s) glucose(s) | | | | | | | |
|  | a) | kJ | b) | kJ | c) | kJ | d) | kJ |
| 110. | All natural processes proceed spontaneously in a direction which: | | | | | | | |
|  | a) | Increases entropy | | | | | | | |
|  | b) | Increases free energy | | | | | | | |
|  | c) | Decreases entropy | | | | | | | |
|  | d) | Decreases free energy | | | | | | | |
| 111. | The heat evolved in the combustion of benzene is given by  When 156 g of is burnt in an open container, the amount of heat energy released will be | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 112. | Which has/have a positive value(s) of ? | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |
| 113. | When a solid melts, there is/are: | | | | | | | |
|  | a) | An increase in entropy | | | | | | | |
|  | b) | An increase in enthalpy | | | | | | | |
|  | c) | A decrease in internal energy | | | | | | | |
|  | d) | A decrease in enthalpy | | | | | | | |
| 114. | Which of the following is/are true in the case of an adiabatic process? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 115. | The intensive property is/are | | | | | | | |
|  | a) | Temperature | b) | Heat capacity | c) | Internal energy | d) | Pressure |
| 116. | Under which of the conditions the process will be spontaneous? | | | | | | | |
|  | a) | ve | b) | ve | c) | ve | d) |  |
| 117. | Select the correct statements for the equilibrium under standard conditions | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 118. | If is work done by the system the mathematical representation of the first law of thermodynamics is/are | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 119. | The second law of thermodynamics states that | | | | | | | |
|  | a) | All Spontaneous processes are thermodynamically irreversible | | | | | | | |
|  | b) | Entropy of the universe is continuously increasing | | | | | | | |
|  | c) | Energy can neither be created nor destroyed | | | | | | | |
|  | d) | Energy of the universe remain constant | | | | | | | |
| 120. | Among the following which is/are the endothermic reaction(s)? | | | | | | | |
|  | a) | Combustion of methane | | | b) | Decomposition of water | | |
|  | c) | Dehydrogenation of ethane to ethylene | | | d) | Conversion of graphite to diamond | | |
| 121. | Average value of poisson’s ratio for a mixture of 2 mol of each gas and is 1.66, then | | | | | | | |
|  | a) | Gases are mono-atomic | | | | | | | |
|  | b) | Gases are diatomic | | | | | | | |
|  | c) | Average molar heat capacity at constant volume is 4 cal | | | | | | | |
|  | d) | Average molar heat capacity at constant is 3 cal | | | | | | | |
| 122. | Indicate in which case/cases the spontaneity of a change is favoured when | | | | | | | |
|  | a) | is | b) | is | c) | is | d) | is |
| 123. | In a reaction, and both are more than zero. In which of the following cases, the reaction would not be spontaneous? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 124. | Which is correct about ? | | | | | | | |
|  | a) |  | | | b) | At equilibrium | | |
|  | c) | At equilibrium | | | d) |  | | |
| 125. | A reaction attains equilibrium state under standard conditions, then: | | | | | | | |
|  | a) | Equilibrium constant | | | b) | Equilibrium constant | | |
|  | c) | and | | | d) | and | | |
| 126. | Which of the following are not correct at 298 K? | | | | | | | |
|  | a) | element=0 | b) | element= 0 | c) | element=0 | d) | compound=0 |
| 127. | Which is not correct relationship between and equilibrium constant | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 128. | The enthalpy change for the process  is called | | | | | | | |
|  | a) | Heat of vaporization | | | b) | Heat of sublimation | | |
|  | c) | Heat of allotropic change | | | d) | Heat of atomisation | | |
| 129. | Which of the following are intensive properties? | | | | | | | |
|  | a) | Heat capacity | b) | Refractive index | c) | Specific volume | d) | Entropy |
| 130. | Which of the following are state properties? | | | | | | | |
|  | a) | Internal energy | b) | Volume | c) | Heat | d) | Enthalpy |
| 131. | In which reactions, is negative? | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 132. | Which of the following statements is/are correct? | | | | | | | |
|  | a) | is for exothermic reactions | | | | | | | |
|  | b) | is for endothermic reactions | | | | | | | |
|  | c) | The heat of neutralization of strong acid and strong bases is constant | | | | | | | |
|  | d) | The enthalpy of fusion is | | | | | | | |
| 133. | Enthalpy change equal internal energy change when | | | | | | | |
|  | a) | All the reactants and products are in solution | | | | | | | |
|  | b) | Reaction is carried out in a closed vessel | | | | | | | |
|  | c) | Number of moles of gaseous reactants and that of products is equal | | | | | | | |
|  | d) | Reaction is carried out at constant pressure | | | | | | | |
| 134. | The process of evaporation of a liquid is accompanied by: | | | | | | | |
|  | a) | Increase in enthalpy | | | | | | | |
|  | b) | Decrease in free energy | | | | | | | |
|  | c) | No change in free energy | | | | | | | |
|  | d) | Increase in entropy | | | | | | | |
| 135. | During an adiabatic reversible expansion of an ideal gas | | | | | | | |
|  | a) | Internal energy of the system decreases | | | b) | Temperature of the system decreases | | |
|  | c) | The value of changes | | | d) | Pressure increases | | |
| 136. | Which of the following are irreversible processes? | | | | | | | |
|  | a) | Mixing of two gases | | | b) | Evaporation of water at 373 K and 1 atm in a closed system | | |
|  | c) | Dissolution of in water | | | d) | at | | |
| 137. | If and are arbitrary extensive variables, then | | | | | | | |
|  | a) | is an extensive variable | | | b) | is an intensive variable | | |
|  | c) | is an intensive variable | | | d) | Both (b) and (c) | | |
| 138. | A certain volume of dry air at NTP is expanded reversibly and isothermally to four times of its volume. The final pressure and temperature are respectively | | | | | | | |
|  | a) | and | b) | and | c) | and | d) | and |
| 139. | Endothermic reactions, having ve may be spontaneous if | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | is very high |
| 140. | The poisson’s ratio for is 1.4. Which of the following are correct for ? | | | | | | | |
|  | a) | cal | b) | cal | c) |  | d) |  |
| 141. | Which of the following conditions is/are favourable for the feasibility of a reaction? | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |
| 142. | If and are work done in isothermal, adiabatic, isobaric, and isochoric reversible expansion for an ideal gas, respectively, then | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 143. | During the isothermal expansion of an ideal gas: | | | | | | | |
|  | a) | The internal energy remains unaffected | | | | | | | |
|  | b) | The temperature remains constant | | | | | | | |
|  | c) | The enthalpy remains unaffected | | | | | | | |
|  | d) | The enthalpy becomes zero | | | | | | | |
| 144. | If and are arbitrary intensive variables, then | | | | | | | |
|  | a) | is an intensive variable | | | b) | is an intensive variable | | |
|  | c) | is an extensive property | | | d) | is an intensive property | | |
| 145. | If it is necessary to employ electric current (electrolysis) to carry out a chemical reaction, then for that reaction: | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 146. | If is the amount of heat absorbed by the system and the amount of work done on the system the change in the energy of the system is given by: | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 147. | Hess’ law is applicable for determination of enthalpy of | | | | | | | |
|  | a) | Reaction | b) | Formation | c) | Transition | d) | None of these |
| 148. | Which of the options given below are correct?  **Nature of reaction** | | | | | | | |
|  | a) | Spontaneous at all temperature | | | | | | | |
|  | b) | Nonspontaneous regardless of temperature | | | | | | | |
|  | c) | Spontaneous only at high temperature | | | | | | | |
|  | d) | Spontaneous only at low temperature | | | | | | | |
| 149. | The open system(s) is/are which | | | | | | | |
|  | a) | Can exchange matter with the surroundings | | | | | | | |
|  | b) | Can exchange energy with the surroundings | | | | | | | |
|  | c) | Can exchange both matter and energy with the surroundings | | | | | | | |
|  | d) | Cannot exchange either matter or energy with the surroundings | | | | | | | |
| 150. | The heat of reaction depends upon: | | | | | | | |
|  | a) | The manner by which the reaction is carried out | | | | | | | |
|  | b) | Temperature at which the reaction is carried out | | | | | | | |
|  | c) | Physical state of reactants and products | | | | | | | |
|  | d) | Whether the reaction is carried out at constant pressure or at constant volume | | | | | | | |
| 151. | For an ideal gas, consider only work in going from an initial state to the final state The final state can be reached by either of the two paths shown in the figure. Which of the following choice(s) is (are) correct? [take as change in entropy and as work done] | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 152. | Which of the following are endothermic processes? | | | | | | | |
|  | a) | Combustion of glucose | | | b) | Decomposition of water | | |
|  | c) | Dehydrogenation of ethane to ethane | | | d) | Conversion of graphite to diamond | | |
| 153. | The heat of neutralization of a strong acid by a strong base is a constant | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 154. | Among the following, the state function(s) is (are): | | | | | | | |
|  | a) | Internal energy | | | | | | | |
|  | b) | Irreversible expansion work | | | | | | | |
|  | c) | Reversible expansion work | | | | | | | |
|  | d) | Molar enthalpy | | | | | | | |
| 155. | Which of the following are thermodynamically stable? | | | | | | | |
|  | a) | C(diamond) | b) | C(graphite) | c) | (white) | d) | (black) |
| 156. | The following is(are) endothermic reaction(s) | | | | | | | |
|  | a) | Combustion of methane | | | b) | Decomposition of water | | |
|  | c) | Dehydrogenation of ethane to ethylene | | | d) | Conversion of graphite to diamond | | |
| 157. | Which is an irreversible process? | | | | | | | |
|  | a) | Mixing of two gases by diffusion | | | b) | Evaporation of water at 373 K and 1 atm pressure | | |
|  | c) | Dissolution of in water | | | d) | All of the above | | |
| 158. | Select the correct statements | | | | | | | |
|  | a) | The magnitude of work involved in an intermediate irreversible expansion is less than that involved in reversible expansion | | | | | | | |
|  | b) | Heat absorbed during intermediate reversible expansion is more that in intermediate reversible expansion | | | | | | | |
|  | c) | The magnitude of work involved in an intermediate reversible compression is more than that involved in intermediate irreversible compression | | | | | | | |
|  | d) | Heat released during intermediate irreversible compression is more than that in intermediate reversible compression | | | | | | | |
| 159. | Which of the following statements is/are false? | | | | | | | |
|  | a) | Work is a state function | | | | | | | |
|  | b) | Temperature is a state function | | | | | | | |
|  | c) | Change in the state is completely defined when the initial and final states are specified | | | | | | | |
|  | d) | Work appears at the boundary of the system | | | | | | | |
| 160. | Which of the following are true about resonance energy? | | | | | | | |
|  | a) | Resonance energy = Experimental heat of formation Calculated heat of formation | | | | | | | |
|  | b) | Resonance energy = Calculated heat of formationExperimental heat of formation | | | | | | | |
|  | c) | Greater the resonance energy, more the compound will be stable | | | | | | | |
|  | d) | Lesser the resonance energy, more the compound will be stable | | | | | | | |

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| **Assertion - Reasoning Type** | | | |
| This section contain(s) 0 questions numbered 161 to 160. Each question containsstatement 1(Assertion) and statement 2(Reason). Each question has the 4 choices (a), (b), (c) and (d) out of which **only one** is correct. | | | |
|  | a) | Statement 1 is True, Statement 2 is True; Statement 2 **is** correct explanation for Statement 1 | |
|  | b) | Statement 1 is True, Statement 2 is True; Statement 2 **is not** correct explanation for Statement 1 | |
|  | c) | Statement 1 is True, Statement 2 is False | |
|  | d) | Statement 1 is False, Statement 2 is True | |

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| 161 |  | | |
|  | **Statement 1:** | | Helium has lower entropy than gas which has lower entropy than gaseous benzene |
|  | **Statement 2:** | | The larger the complexity of molecule, the larger is its absolute entropy |

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| 162 |  | | |
|  | **Statement 1:** | | Heat of neutralization for is whereas for it is |
|  | **Statement 2:** | | The acid is weak acid. |

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| 163 |  | | |
|  | **Statement 1:** | | Work and heat are not state functions. |
|  | **Statement 2:** | | The sum of is state function. |

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| 164 |  | | |
|  | **Statement 1:** | | Internal energy of a system is an extensive property. |
|  | **Statement 2:** | | The internal energy of a system depends upon the amount and physical state of the substance. |

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| 165 |  | | |
|  | **Statement 1:** | |  |
|  | **Statement 2:** | | This is an experimental proof of Hess’s law. |

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| 166 |  | | |
|  | **Statement 1:** | | The change in entropy during melting of ice is negligible in comparison to change in entropy during vaporization . |
|  | **Statement 2:** | | The volume occupied by solid and liquid is too less in comparison to volume occupied by gas. |

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| 167 |  | | |
|  | **Statement 1:** | | Internal energy change in a cyclic process is zero |
|  | **Statement 2:** | | Internal energy is a state function |

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| 168 |  | | |
|  | **Statement 1:** | | The enthalpy of formation of is equal to the bond energy of |
|  | **Statement 2:** | | The enthalpy of formation and the bond energy both involve formation of one mole of from the elements |

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| 169 |  | | |
|  | **Statement 1:** | | The ratio of heat of vaporization and the normal boiling point of a liquid is approximately 88 J/mol. |
|  | **Statement 2:** | | This is Trouton’s rule derived by experimental data. |

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| 170 |  | | |
|  | **Statement 1:** | | The entropies of are not zero at absolute zero. |
|  | **Statement 2:** | | These are exceptions to III law of thermodynamics. |

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| 171 |  | | |
|  | **Statement 1:** | | When a real gas is allowed to expand adiabatically through a fine hole from a region of high pressure to a region of low pressure, the temperature of the gas falls |
|  | **Statement 2:** | | Work is done at the cost of internal energy of the gas |

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| 172 |  | | |
|  | **Statement 1:** | | The heat of neutralization of perchloric acid, , with is same as that of with |
|  | **Statement 2:** | | Both and are strong acids |

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| 173 |  | | |
|  | **Statement 1:** | | Heat of combustion are always exothermic. |
|  | **Statement 2:** | | Combustion of to give is exothermic. |

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| 174 |  | | |
|  | **Statement 1:** | | When hydrogen gas at high pressure and room temperature expands adiabatically into a region of low pressure, there is a decrease in temperature |
|  | **Statement 2:** | | Hydrogen gas at temperature is above its inversion temperature |

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| 175 |  | | |
|  | **Statement 1:** | | The enthalpy of formation of is greater than that of |
|  | **Statement 2:** | | Enthalpy change is negative for the condensation reaction |

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| 176 |  | | |
|  | **Statement 1:** | | Standard heat enthalpy of a compound is its heat of formation of 25°C and 1 atm. |
|  | **Statement 2:** | | Standard heat enthalpy of pure elements have arbitrarily assumed to be zero. |

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| 177 |  | | |
|  | **Statement 1:** | | Combustion of to give is endothermic. |
|  | **Statement 2:** | | Bond energy of is very high. |

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| 178 |  | | |
|  | **Statement 1:** | | There is a natural asymmetry between converting work to heat and converting heat to work. |
|  | **Statement 2:** | | No process is possible in which the sole result is the absorption of heat from a reservoir and its complete conversion into work. |

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| 179 |  | | |
|  | **Statement 1:** | | Heat of neutralization for both andwith is |
|  | **Statement 2:** | | is a strong electrolyte/base |

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| 180 |  | | |
|  | **Statement 1:** | | Neither nor is state function but is state function. |
|  | **Statement 2:** | | is state function. |

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| 181 |  | | |
|  | **Statement 1:** | | Zeroth law can also be termed as law of thermal equilibrium |
|  | **Statement 2:** | | Two objects in thermal equilibrium with the third one, are in thermal equilibrium with each other |

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| 182 |  | | |
|  | **Statement 1:** | | Phase transition involves change in internal energy only. |
|  | **Statement 2:** | | Phase transition occurs at constant pressure. |

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| 183 |  | | |
|  | **Statement 1:** | | In a diatomic molecule involving two like atoms covalently bonded with each other, bond energy = 2 × heat of formation of atom. |
|  | **Statement 2:** | |  |

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| 184 |  | | |
|  | **Statement 1:** | | The zeroth law of thermodynamics was known before I law of thermodynamics. |
|  | **Statement 2:** | | The zeroth law concerning thermal equilibrium was appeared after three laws (I, II and III) of thermodynamics and thus, was named as zeroth law. |

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| 185 |  | | |
|  | **Statement 1:** | | The SI unit of entropy is . |
|  | **Statement 2:** | | . |

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| 186 |  | | |
|  | **Statement 1:** | | The endothermic reactions are favoured at lower temperature and the exothermic reactions arefavoured at higher temperature |
|  | **Statement 2:** | | When a system in equilibrium is disturbed by changing the temperature, it will tend to adjust itself so as to overcome the effect of the change |

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| 187 |  | | |
|  | **Statement 1:** | | Both work and heat are manifested by an effect in the surroundings. |
|  | **Statement 2:** | | Work done by/on the system and appear only at the boundary of system. |

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| 188 |  | | |
|  | **Statement 1:** | | The dissolution of in water is endothermic, though it is spontaneous process. |
|  | **Statement 2:** | | for the process is because is very low and thus |

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| 189 |  | | |
|  | **Statement 1:** | | The enthalpy of both graphite and diamond is taken to be zero, being elementary substances |
|  | **Statement 2:** | | The enthalpy of formation of an elementary substance in any state is taken as zero |

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| 190 |  | | |
|  | **Statement 1:** | | A reaction which is spontaneous and accompanied by decrease of randomness must be exothermic |
|  | **Statement 2:** | | All exothermic reactions are accompanied by decrease of randomness |

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| 191 |  | | |
|  | **Statement 1:** | | Decrease in free energy causes spontaneous reaction |
|  | **Statement 2:** | | Spontaneous reactions are invariably exothermic |

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| 192 |  | | |
|  | **Statement 1:** | | An exothermic process, non-spontaneous at high temperature, may become spontaneous at low pressure |
|  | **Statement 2:** | | With decrease in temperature, randomness (entropy) decreases |

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| 193 |  | | |
|  | **Statement 1:** | | The change in internal energy and change in heat enthalpy does not depend upon the path by which changes are brought in. |
|  | **Statement 2:** | | Both and are path independent as and are state functions. |

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| 194 |  | | |
|  | **Statement 1:** | | Fall of water as rain drops from clouds is spontaneous. |
|  | **Statement 2:** | | During the process entropy increases. |

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| 195 |  | | |
|  | **Statement 1:** | | The enthalpy of formation of gaseous oxygen molecules at 298 K and under a pressure of 1 atm is zero |
|  | **Statement 2:** | | The entropy of formation of gaseous oxygen molecules under the same condition is zero |

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| 196 |  | | |
|  | **Statement 1:** | | A non-spontaneous endothermic reaction at room temperature may be spontaneous at high temperature. |
|  | **Statement 2:** | | At high temperature becomes more than . |

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| 197 |  | | |
|  | **Statement 1:** | | When a gas at high pressure expands against vacuum, the work done is maximum |
|  | **Statement 2:** | | Work done in expansion depends upon the pressure inside the gas and increase in volume |

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| 198 |  | | |
|  | **Statement 1:** | | For a particular reaction, heat of combustion at constant pressure is always greater than that at constant volume |
|  | **Statement 2:** | | Combustion reactions are invariably accomplished by increase in number of moles |

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| 199 |  | | |
|  | **Statement 1:** | | for an ideal gas |
|  | **Statement 2:** | | for an ideal gas |

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| 200 |  | | |
|  | **Statement 1:** | | Heat of combustion of is and heat of combustion of is but is better fuel. |
|  | **Statement 2:** | | The better fuel has high calorific value. |

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| 201 |  | | |
|  | **Statement 1:** | | There is no reaction known for which is positive, yet it is spontaneous |
|  | **Statement 2:** | | For photochemical reaction, is negative |

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| 202 |  | | |
|  | **Statement 1:** | | Many endothermic reactions that are not spontaneous at room temperature become spontaneous at high temperature |
|  | **Statement 2:** | | Entropy of the system increases with increase in temperature |

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| 203 |  | | |
|  | **Statement 1:** | | The Heat of ionization of water is equal to the heat of neutralization of a strong acid with a strong base |
|  | **Statement 2:** | | Water ionizes to a very small extent while ions from an acid combine very rapidly with from a base to form |

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| 204 |  | | |
|  | **Statement 1:** | | The thermodynamic factor which determines the spontaneity of a process is the free energy. For a process to be spontaneous the free energy must be |
|  | **Statement 2:** | | The change in free energy is related to the change in a process must always be positive if it is spontaneous |

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| 205 |  | | |
|  | **Statement 1:** | | Internal energy is an extensive property |
|  | **Statement 2:** | | Internal energy depends upon the amount of the system |

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| 206 |  | | |
|  | **Statement 1:** | | Enthalpy of graphite is lower than that of diamond |
|  | **Statement 2:** | | Entropy of graphite is lower than that of diamond |

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| 207 |  | | |
|  | **Statement 1:** | | The Joules-Thomson coefficient for an ideal gas is zero |
|  | **Statement 2:** | | There are no intermolecular attractive forces in an ideal gas |

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| 208 |  | | |
|  | **Statement 1:** | | Absolute values of internal energy of substance can’s be determined |
|  | **Statement 2:** | | It is impossible to determine exact values of constituent energies of the substances |

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| 209 |  | | |
|  | **Statement 1:** | | Bond energy for breaking up a bond is endothermic. |
|  | **Statement 2:** | | Heat is required to overpower the attractions between two atoms. |

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| 210 |  | | |
|  | **Statement 1:** | | The heat absorbed during the isothermal expansion of an ideal gas against vacuum is zero. |
|  | **Statement 2:** | | The volume occupied by the molecules of an ideal gas is zero. |

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| 211 |  | | |
|  | **Statement 1:** | | Heat of neutralization can be given as : |
|  | **Statement 2:** | | Heat of neutralization can be alternatively defined as heat of formation of water. |

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| 212 |  | | |
|  | **Statement 1:** | | The mass and volume of a substance are the extensive properties and are proportional to each other |
|  | **Statement 2:** | | The ratio of mass of a sample to its volume is an intensive property |

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| 213 |  | | |
|  | **Statement 1:** | | The variation of heat of reaction with temperature are given in terms of Kirchhoff’s equation. |
|  | **Statement 2:** | | The Kircchoff’s equation is : |

|  |  |  |  |
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| 214 |  | | |
|  | **Statement 1:** | | Pressure, volume, and temperature are all extensive properties |
|  | **Statement 2:** | | Extensive properties depend upon the amount and nature of the substance |

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| **Matrix-Match Type** | | | | | | | | | |
| This section contain(s) 0 question(s). Each question contains Statements given in 2 columns which have to be matched. Statements (A, B, C, D) in **columns I** have to be matched with Statements (p, q, r, s) in **columns II**. | | | | | | | | | |

| 215. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (1) | | Phase transition | |
|  | **(B)** |  | | (2) | | Allotropic change | |
|  | **(C)** | ) | | (3) | |  | |
|  | **(D)** |  | | (4) | |  | |
|  |  |  | | (5) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | 4 | 5 | 1,2,3 | 1,3,4 |  |  |
|  | **b)** | 1,3,4 | 4 | 5 | 1,2,3 |  |  |
|  | **c)** | 1,2,3 | 5 | 4 | 1,3,4 |  |  |
|  | **d)** | 5 | 1,2,3 | 4 | 1,3,4 |  |  |

| 216. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Amount of heat required to raise the temperature of 1 mol substance by | | (p) | | Specific heat Molar mass | |
|  | **(B)** |  | | (q) | | Heat capacity or | |
|  | **(C)** | Heat evolved in the combustion of 1 g of a substance | | (r) | | Electron gain enthalpy | |
|  | **(D)** | Heat evolved when an extra electron is added to valence shell of an isolated gaseous atom | | (s) | | Calorific value | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | Q,p | s | r | p,q |  |  |
|  | **b)** | s | r | p,q | q,p |  |  |
|  | **c)** | p,q | q,p | s | r |  |  |
|  | **d)** | r | p,q | q,p | s |  |  |

| 217. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Enthalpy | | (p) | | Intrinsic property | |
|  | **(B)** | Temperature | | (q) | | Path function | |
|  | **(C)** | Free energy | | (r) | | Function of | |
|  | **(D)** | Work | | (s) | | State function | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | p | r | q | s |  |  |
|  | **b)** | q | r | p | r |  |  |
|  | **c)** | r | p | r | q |  |  |
|  | **d)** | s | p | q | r |  |  |

| 218. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | | done by system | |
|  | **(B)** |  | | (q) | | Second law of thermodynamics | |
|  | **(C)** |  | | (r) | | Non-spontaneous | |
|  | **(D)** |  | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | p | q | r | s |  |  |
|  | **b)** | q | r | s | p |  |  |
|  | **c)** | s | p | q | r |  |  |
|  | **d)** | r | s | p | q |  |  |

| 219. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Gibbs-Helmholtz reaction | | (p) | | Degree of randomness | |
|  | **(B)** | First law of thermodynamic | | (q) | |  | |
|  | **(C)** | Enthalpy at constant pressure | | (r) | | Law of conservation of energy | |
|  | **(D)** | Entropy | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | r | s | q | p |  |  |
|  | **b)** | p | q | s | r |  |  |
|  | **c)** | s | r | p | q |  |  |
|  | **d)** | q | p | r | s |  |  |

| 220. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Isothermal process (reversible) | | (p) | |  | |
|  | **(B)** | Adiabatic process (reversible) | | (q) | |  | |
|  | **(C)** | Adiabatic free expansion | | (r) | |  | |
|  | **(D)** | Isothermal free expansion | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | s | q | p,r | s |  |  |
|  | **b)** | p,r | s | q | q |  |  |
|  | **c)** | q | p,r | s | q |  |  |
|  | **d)** | p | s | q | p,r |  |  |

| 221. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | |  | |
|  | **(B)** |  | | (q) | |  | |
|  | **(C)** |  | | (r) | |  | |
|  | **(D)** |  | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | P,q | p,q | r | r |  |  |
|  | **b)** | r | s | p,q | r |  |  |
|  | **c)** | p | r | s | p,q |  |  |
|  | **d)** | p,q | q | r | s |  |  |

| 222. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | |  | |
|  | **(B)** |  | | (q) | |  | |
|  | **(C)** |  | | (r) | |  | |
|  | **(D)** |  | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | Q,r | q,s | q | p,q |  |  |
|  | **b)** | q | q,r | p,q | q,s |  |  |
|  | **c)** | q,s | p,q | q | q,r |  |  |
|  | **d)** | p,q | q | q,r | q,s |  |  |

| 223. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | | Combustion | |
|  | **(B)** |  | | (q) | | Neutralization | |
|  | **(C)** |  | | (r) | | Process of formation | |
|  | **(D)** |  | | (s) | | Used in fuel cell | |
|  | **CODES :** | | | | | | | |

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|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | P,r | p | q | p,r,s |  |  |
|  | **b)** | p | q | p,r | r,s |  |  |
|  | **c)** | q | r,s | q | p,r |  |  |
|  | **d)** | p,r,s | p,r | p | q |  |  |

| 224. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | For spontaneous reaction | | (p) | |  | |
|  | **(B)** | For endothermic reaction | | (q) | |  | |
|  | **(C)** | Bond dissociation energy | | (r) | |  | |
|  | **(D)** | For solids and liquids in a thermochemical reaction | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | r | s | p | q |  |  |
|  | **b)** | s | r | q | p |  |  |
|  | **c)** | p | q | r | s |  |  |
|  | **d)** | q | p | s | r |  |  |

| 225. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Hess’ law | | (p) | |  | |
|  | **(B)** | Combustion reaction | | (q) | | Boiling point in Kelvin | |
|  | **(C)** | Trouton’s law | | (r) | | Exothermic | |
|  | **(D)** | Clausius-Cal-peyron equation | | (s) | | remains the same irrespective steps | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | s | r | q | p |  |  |
|  | **b)** | r | s | p | q |  |  |
|  | **c)** | p | q | s | r |  |  |
|  | **d)** | q | p | r | s |  |  |

| 226. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Spontaneous process | | (p) | | ve | |
|  | **(B)** | Heat flow from high temperature of system towards low temperature of surroundings | | (q) | | ve | |
|  | **(C)** | Exergonic process | | (r) | | ve | |
|  | **(D)** | Increase in the randomness of system by heating | | (s) | | ve | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | P,r,s | q | q,r | r,s |  |  |
|  | **b)** | r,s | p,r,s | q | q,r |  |  |
|  | **c)** | q | q,r | r,s | p,rs |  |  |
|  | **d)** | q,r | r,s | p,rs | q |  |  |

| 227. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | | or | |
|  | **(B)** |  | | (q) | |  | |
|  | **(C)** | or | | (r) | |  | |
|  | **(D)** |  | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | P,q | p,r | p | s |  |  |
|  | **b)** | p | p,q | s | p,r |  |  |
|  | **c)** | p,r | s | p,q | p |  |  |
|  | **d)** | s | p | p,r | p,q |  |  |

| 228. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | | Isothermal process | |
|  | **(B)** |  | | (q) | |  | |
|  | **(C)** |  | | (r) | | Adiabatic reaction | |
|  | **(D)** |  | | (s) | | Van der waals gas | |
|  | **(E)** |  | | (t) | | Ideal gas | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** | **E** |  |
|  | **a)** | r | t | q | s | q |  |
|  | **b)** | t | r | p | q | q |  |
|  | **c)** | q | p | s | t | q |  |
|  | **d)** | s | q | t | p | q |  |

| 229. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | | Trouton equation | |
|  | **(B)** |  | | (q) | | Effect of temperature on the heat of reaction | |
|  | **(C)** |  | | (r) | | Kirchhoff’s equation | |
|  | **(D)** |  | | (s) | | Third law of thermodynamics | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | Q,r | p,r | s | p |  |  |
|  | **b)** | p | s | q,r | p,r |  |  |
|  | **c)** | s | p | p,r | q,r |  |  |
|  | **d)** | p,r | q,r | p | s |  |  |

| 230. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (1) | |  | |
|  | **(B)** |  | | (2) | |  | |
|  | **(C)** |  | | (3) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | 2 | 3 | 1 |  |  |  |
|  | **b)** | 3 | 1 | 2 |  |  |  |
|  | **c)** | 1 | 2 | 3 |  |  |  |
|  | **d)** | 1 | 3 | 2 |  |  |  |

| 231. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Joule-Thomson coefficient | | (p) | |  | |
|  | **(B)** | Kirchhoff’s equation | | (q) | |  | |
|  | **(C)** | Ideal gas | | (r) | |  | |
|  | **(D)** | Inversion temperature | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | r | p | q | s |  |  |
|  | **b)** | p | q | s | r |  |  |
|  | **c)** | s | r | p | q |  |  |
|  | **d)** | q | s | r | p |  |  |

| 232. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | (Heat of formation)exp-  (Heat of formation)calculated | | (p) | | Heat of reaction | |
|  | **(B)** |  | | (q) | | Resonance energy | |
|  | **(C)** | (Heat of combustion)Reactants- (Heat of combustion)Products - | | (r) | |  | |
|  | **(D)** |  | | (s) | | Used in calorimetric method | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | P,r,s | q | r,s | p,r |  |  |
|  | **b)** | q | p,r | p,r | p,r,s |  |  |
|  | **c)** | p,r | p | p,r,s | q |  |  |
|  | **d)** | p,r | p,r,s | q | r,s |  |  |

| 233. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | |  | |
|  | **(B)** |  | | (q) | |  | |
|  | **(C)** |  | | (r) | |  | |
|  | **(D)** |  | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | s | p,q | p | r |  |  |
|  | **b)** | p,q | p,q | s | s |  |  |
|  | **c)** | q | s | p,q | s |  |  |
|  | **d)** | p,q | p | s | p,q |  |  |

| 234. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | |  | |
|  | **(B)** |  | | (q) | | For reversible process | |
|  | **(C)** |  | | (r) | | Non ideal solutions with negative | |
|  | **(D)** |  | | (s) | | For an ideal gas undergoing expansion isothermally | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | P,r | s | r | q |  |  |
|  | **b)** | s | p,r | q | r |  |  |
|  | **c)** | r | q | p,r | s |  |  |
|  | **d)** | q | r | s | p,r |  |  |

| 235. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | |  | |
|  | **(B)** |  | | (q) | |  | |
|  | **(C)** |  | | (r) | |  | |
|  | **(D)** |  | | (s) | | Forward shift by increasing pressure | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | q | q | p | r,s |  |  |
|  | **b)** | q | p | r,s | s |  |  |
|  | **c)** | r,s | s | p | q |  |  |
|  | **d)** | p | r,s | q | p |  |  |

| 236. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | (Isolated system) | | (p) | | Spontaneous | |
|  | **(B)** |  | | (q) | | Non-spontaneous photochemical reaction | |
|  | **(C)** |  | | (r) | | Equilibrium | |
|  | **(D)** |  | | (s) | | Non-spontaneous | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | p | p,q | r | s |  |  |
|  | **b)** | p,q | r | s | p |  |  |
|  | **c)** | r | s | p | p,q |  |  |
|  | **d)** | s | p | p,q | r |  |  |

| 237. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Exothermic | | (p) | |  | |
|  | **(B)** | Endothermic | | (q) | | is negative | |
|  | **(C)** | Spontaneous | | (r) | | is positive | |
|  | **(D)** | Heat of reaction | | (s) | | is negative | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | s | p | q | r |  |  |
|  | **b)** | q | r | s | p |  |  |
|  | **c)** | p | s | r | q |  |  |
|  | **d)** | r | q | p | s |  |  |

| 238. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (1) | |  | |
|  | **(B)** |  | | (2) | |  | |
|  | **(C)** |  | | (3) | |  | |
|  | **(D)** |  | | (4) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | 1,4,5 | 3 | 2 | 5,2,4 |  |  |
|  | **b)** | 3,2,1 | 1 | 5 | 4,2,1 |  |  |
|  | **c)** | 1,3,4 | 4 | 5 | 1, 2, 3 |  |  |
|  | **d)** | 5,3,4 | 2 | 4 | 4, 5,3 |  |  |

| 239. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** |  | | (p) | |  | |
|  | **(B)** |  | | (q) | |  | |
|  | **(C)** |  | | (r) | |  | |
|  | **(D)** |  | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | P,r | q | s | p,r |  |  |
|  | **b)** | q | s | p,r | p |  |  |
|  | **c)** | s | p,r | q | p,r |  |  |
|  | **d)** | p,r | s | p,r | q |  |  |

| 240. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Temperature of a system always decreases | | (p) | |  | |
|  | **(B)** |  | | (q) | | Internal energy increases | |
|  | **(C)** | Temperature of the system increases | | (r) | | Ideal gas | |
|  | **(D)** | ∆(hydrogenation(experimental)  <∆H(hydrogenation(calculated) | | (s) | | Adiabatic expansion | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | s | r | q | p |  |  |
|  | **b)** | p | q | r | s |  |  |
|  | **c)** | r | s | p | q |  |  |
|  | **d)** | q | p | s | r |  |  |

| 241. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | The amount of energy which must be invested in reaction to get it started | | (p) | | Chemical equilibrium | |
|  | **(B)** | A state in which the rate of forward reaction is exactly equal to the rate of the reverse reaction | | (q) | | Activation energy | |
|  | **(C)** | A process or reaction which consumes heat | | (r) | | Endothermic | |
|  | **(D)** | A process or reaction that releases heat | | (s) | | Exothermic | |
|  |  |  | | (t) | | Threshold energy | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | q | p | r | s |  |  |
|  | **b)** | r | q | s | p |  |  |
|  | **c)** | s | p | q | r |  |  |
|  | **d)** | p | r | s | q |  |  |

| 242. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Isothermal process (reversible) | | (p) | |  | |
|  | **(B)** | Adiabatic process | | (q) | | constant | |
|  | **(C)** |  | | (r) | |  | |
|  | **(D)** | Irreversible isothermal process | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | q | s | p,r | q |  |  |
|  | **b)** | s | r | p | p,r |  |  |
|  | **c)** | p,r | q | q | s |  |  |
|  | **d)** | q | p,r | s | q |  |  |

| 243. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | equation | | (1) | |  | |
|  | **(B)** | equation | | (2) | |  | |
|  | **(C)** | Hoff isochore | | (3) | |  | |
|  | **(D)** | Gibb’s Helmholtz equation | | (4) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | 4 | 3 | 2 | 1 |  |  |
|  | **b)** | 1 | 2 | 3 | 4 |  |  |
|  | **c)** | 3 | 4 | 1 | 2 |  |  |
|  | **d)** | 2 | 1 | 4 | 3 |  |  |

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| **Linked Comprehension Type**  This section contain(s) 48 paragraph(s) and based upon each paragraph, multiple choice questions have to be answered. Each question has atleast 4 choices (a), (b), (c) and (d) out of which **only one** is correct.  **Paragraph for Question Nos. 244 to -244** | | | | | | | | |
| If the boundary of system moves by an infinitesimal amount, the work involved is given bydW=-pextdVFor irreversible process, W=-pext∆VFor reversible process, pext=pint±dp≈pintSo, for reversible isothermal process, W=-nRT InVjVi 2 moles of an ideal gas undergoes isothermal compression along three different paths(a)A single stage compression against a constant external pressure of 20 bar(b)Reversible compression from pi=2 bar and Vi= 8 L to pj=20 bar(c)A two stage compression consisting initially of compression against a constant external pressure of 10 bar until pgas=pext, followed by compression against a constant pressure of 20 bar until pgas=pext | | | | |

| 244. | Work done on the gas in single stage compression is | | | | | | | |
|  | a) | 144 bar-L | b) | 98 bar-L | c) | 54 bar-L | d) | 121 bar-L |
| **Paragraph for Question Nos. 245 to - 245** | | | | | | | | |

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| Molar heat capacity is the heat required to raise the temperature of one mole of material by one degree, since heat is not a state function, the amount of heat required to produce a given change in its state depends on the path followedCp= Specific heat × Molecular weight. It is measured at constant pressureCV= Specific heat × Molecular weight. It is measured at constant volume | | | | |

| 245. | The specific heat of a gas at constant volume is 0.075 cal/g. Predict the atomicity of the gas. Molar mass of gas is 40 g | | | | | | | |
|  | a) | 3 | b) | 2 | c) | 1 | d) | None of these |
| **Paragraph for Question Nos. 246 to - 246** | | | | | | | | |

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| Gibbs-Helmholtz equation relates the free energy change to the enthalpy and entropy changes of the process as∆GPT=∆H-T ∆SThe magnitude of ∆H does not change much with the change in temperature but the entropy factor T ∆S changes appreciably. Thus, spontaneity of a process depends very much on temperature | | | | |

| 246. | When is heated to a high temperature, it undergoes decomposition into and whereas it is quite stable at room temperature. The most likely explanation of it is | | | | | | | |
|  | a) | The enthalpy of reaction overweigths the term at high temperature | | | | | | | |
|  | b) | The term overweigths the enthalpy of reaction at high temperature | | | | | | | |
|  | c) | At high temperature, both enthalpy of reaction and entropy change become negative | | | | | | | |
|  | d) | None of these | | | | | | | |
| **Paragraph for Question Nos. 247 to - 247** | | | | | | | | |

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| The enthalpy change for chemical reaction is denoted as ∆Hand ∆H⊝=HP⊝-HR⊝. The relation between enthalpy and internal energy is expressed by equation:∆H=∆U+∆nRTWhere ∆U= change in internal energy, ∆n=change in number of moles, R= gas constant | | | | |

| 247. | Given that:  The heat of sublimation of A will be | | | | | | | |
|  | a) |  | b) |  | c) | or | d) |  |
| **Paragraph for Question Nos. 248 to - 248** | | | | | | | | |

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| For an ideal gas, an illustration of three different paths A, B+C and (D+E) from an initial state P1,V1,T1 to a final state P2, V2, T1 is shown in the given figurePath A represents a reversible isothermal expansion from P1,V1to P2,V2. Path (B+C) represents a reversible adiabatic expansion (B) from P1V1, T1 toP3,V2, T2 followed by reversible heating the gas at constant volume (C) from P3, V2, T2to P2, V2, T1. Path (D+E) represents a reversible expansion at constant pressure P1(D) from P1, V1, T1 to P1, V2, T3 followed by a reversible cooling at constant volume V2(E) from P1, V2, T3 to P2, V2, T1 | | | | |

| 248. | What is , for path ? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 249 to - 249** | | | | | | | | |

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| Concrete is produced from a mixture of cement, water and small stones. Small amount of gypsum, CaSO4∙2H2O is added in cement production to improve the subsequent hardening of concrete. The elevated temperature during the production of cement may lead to the formation of unwanted hemihydrate CaSO4∙12H2O according to reaction,CaSO4∙2H2Os→CaSO4∙12H2Os+32H2O(g)The ∆fH⊖ofCaSO4∙2H2Os, CaSO4∙12H2Os,H2O(g) are -2021.0 kJ mol-1, -1575.0kJ mol-1 and -241.8 kJ mol-1 respectively. The respective values of their standard entropies are 194.0, 130.0 and 188.0 J K-1 mol-1. The values of R=8.314 J K-1mol-1=0.0831 L bar mol-1K-1Answer the following questions on the basis of above information | | | | |

| 249. | Heat change occurring during conversion of 1 kg of (molar mass 172 g ) of is equal to | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 250 to - 250** | | | | | | | | |

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| A sample of ideal gas undergoes isothermal expansion in a reversible manner from volume V1 to volume V2. The initial pressure is P1 and the final pressure is P2. The same sample is then allowed to undergo reversible expansion under adiabatic conditions from volume V1to V2. The initial pressure being same but final pressure is P2 | | | | |

| 250. | The work of expansion in adiabatic process is related to work of expansion in isothermal process as | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 251 to - 251** | | | | | | | | |

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| Free energy, G=H-TS, is a state function that indicates whether a reaction is spontaneous or non-spontaneous. If you think of TS as the part of the system’s energy that is disordered already, then (H-TS) is the part of the system’s energy that is still ordered and therefore free to cause spontaneous change by becoming disorderedAlso, ∆G=∆H-T ∆SFrom the second law of thermodynamics, a reaction is spontaneous if ∆totalS is positive, non-spontaneous if ∆totalS is negative, and at equilibrium if ∆totalS is zero.Since, -T ∆S=∆G and since ∆G and ∆S have opposite signs, we can restate the thermodynamic criterion for the spontaneity of a reaction carried out a constant temperature and pressureIf ∆G<0, the reaction is spontaneousIf ∆G>0, the reaction is non-spontaneousIf ∆G=0, the reaction is at equilibriumRead the above paragraph carefully and answer the following questions based on the above comprehension | | | | |

| 251. | For the spontaneity of a reaction, which statement is true? | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |
| **Paragraph for Question Nos. 252 to - 252** | | | | | | | | |

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| The state of a mole of an ideal gas changed from state A at pressure 2P and volume V follows four different processes and finally returns to initial state A reversibly as shown below in the graph. By interpreting the graph, answer the following questions | | | | |

| 252. | Which is the kind of process followed from state to state ? | | | | | | | |
|  | a) | Isochoric expansion | | | b) | Isobaric expansion | | |
|  | c) | Isothermal reversible expansion | | | d) | Isothermal irreversible compression | | |
| **Paragraph for Question Nos. 253 to - 253** | | | | | | | | |

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| The second law of thermodynamics is a fundamental law of science. In this problem, we consider the thermodynamics of an ideal gas, phase transition, and chemical equilibriumThree moles of CO2 gas expands isothermally (in thermal contact with the surroundings; temperature=15℃) against a fixed external pressure of 1.00 bar. The initial and final volumes of the gas are 10.0 L and 30.0 L, respectively | | | | |

| 253. | Select the correct order of the entropy change | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |
| **Paragraph for Question Nos. 254 to - 254** | | | | | | | | |

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| A sample consisting of 1 mol of a mono-atomic perfect gas CV=32R is taken through the cycle as shown | | | | |

| 254. | Temperature at points (1), (2), and (3), respectively is | | | | | | | |
|  | a) | 273 K, 546 K, 273 K | b) | 546 K, 273K, 273K | c) | 273K, 273K, 273K | d) | 546K, 546K, 273K |
| **Paragraph for Question Nos. 255 to - 255** | | | | | | | | |

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| Chemical reactions are invariably associated with the transfer of energy either in the form of heat or light. In the laboratory, heat changes in physical and chemical processes are measured with an instrument call calorimeter. Heat change in the process is calculated asq=ms ∆T s=Specific heat=c∆T c=Heat capacityHeat of reaction at constant volume is measured using bomb calorimeterqV=∆U=Internal energy changeHeat of reaction at constant pressure is measured using simple or water calorimeterqP=∆HqP=qV+P ∆V∆H=∆U+∆nRT | | | | |

| 255. | Match **List I**with**List II** and select the answer from the given codes   |  |  |  |  | | --- | --- | --- | --- | | **List I** | | **List II** | | | A |  | p |  | | B |  | q |  | | C |  | r |  | | D |  | s |  | | E |  | t |  | | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| **Paragraph for Question Nos. 256 to - 256** | | | | | | | | |

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| Bond energies can be obtained by using the following relation:∆H(reaction)=Bond energy of bonds, broken in the reactants-Bond energy of bonds, formed in the productsBond energy depends on three factors:a. Greater is the bond length, lesser is the bond energyb. Bond energy increases with the bond multiplicityc. Bond energy increases with the electronegativity difference between the bonding atoms | | | | |

| 256. | Arrange and bonds in the decreasing order of bond energy | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| **Paragraph for Question Nos. 257 to - 257** | | | | | | | | |

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| A change in the free energy of a system at constant temperature and pressure will be:∆sysG=∆sysH-T∆sysSAt constant temperature and pressure∆sysG<0 (spontaneous)∆sysG=0(equilibrium)∆sysG>0(non-spontaneous) | | | | |

| 257. | The free energy for a reaction having cal, at is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 258 to - 258** | | | | | | | | |

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| 258. | Process represents | | | | | | | |
|  | a) | Isobaric | b) | Isochoric | c) | Isothermal | d) | Isoentropic |
| **Paragraph for Question Nos. 259 to - 259** | | | | | | | | |

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| The thermodynamic property that measures the extent of molecular disorder is called entropy. Entropy change of phase transformation can be calculated using Trouton’sformula (∆S=∆HT). In the reversible adiabatic process, however, ∆S will be zero. The rise in temperature in isobaric and isochoric conditions is found to increase the randomness or entropy of the system∆S=2.303logT1T2 | | | | |

| 259. | The entropy change in an adiabatic process is | | | | | | | |
|  | a) | Zero | b) | Positive | c) | Negative | d) | Remains true |
| **Paragraph for Question Nos. 260 to - 261** | | | | | | | | |

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| The pressure-volume of varius thermodynamic processes is shown in graphs:Work is the mole of transference of energy. It has been observed that reversible work done by the system is the maximum obtainable workwrev>wirrThe works of isothermal and adiabatic processes are different from each otherwisothermal reversible=2.303nRTlog10V2V1=2.303nRTlog10P2P1wadiabatic reversible=CVT1-T2 | | | | |

| 260. | If and are work done in isothermal, adiabatic, isobaric, and isochoric reversible processes, respectively then the correct sequence (for expansion) would be | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 261 to - 261** | | | | | | | | |

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| The change in internal energy (U) can be brought about in two ways:(i) Either by allowing the heat to flow into the system or out of the system.(ii) By doing work on the system or the work done by the system.Using the symbol q to represent heat transferred to system and using work done by the system -W, we can represent the internal energy change of a system, ∆u, as q=∆U+(-W) (First law of thermodynamics)If the reaction is carried out in a closed container with constant volume, so that ∆V=0.Hence, qv=∆UOn the other hand, if a reaction is carried out in open vessel that keeps the pressure constant and allows the volume of the system to change freely. In such case, ∆V≠0 and -W=P∙∆V.Hence, qp=∆U+P∆VAlso qp=qv+∆ngRTAs reactions carried out at constant pressure are so common, the heat change for such process is given a special symbol ∆H, called the enthalpy change of the reaction. The enthalpy (H) of the system is the name given to the quantity (U+PV). | | | | |

| 261. | In which of the following cases and are not equal to each other? | | | | | | | |
|  | a) | The reaction involves no gaseous reactant and product | | | | | | | |
|  | b) | The number of moles of gaseous reactants and gaseous product is not equal to each other | | | | | | | |
|  | c) | The number of moles of gaseous reactants and gaseous products is equal to each other | | | | | | | |
|  | d) | The process is carried out in closed vessel | | | | | | | |
| **Paragraph for Question Nos. 262 to - 262** | | | | | | | | |

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| --- | --- | --- | --- | --- |
| Chemical reactions are usually exothermic or endothermic. A balanced thermochemical equation involving physical states of reactants and products expresses the chemical changes as well as heat of reaction. Heat changes are usually expressed in terms of ∆H(at constant P) or ∆U (at constant V). The heats of reactions varies with physical state of reactants and products, conditions of constant pressure or volume and temperature. Heats of combustion and heat of neutralization, heat of condensation are always exothermic. Standard heat enthalpy of a compound is its heat of formation at 1 atm P and 25C. | | | | |

| 262. | The heat energy released during neutralization of 1 eq. of and with 1 eq. of and 1 eq. of are respectively : | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |

**Integer Answer Type**

| 263. | A reaction becomes spontaneous only at If at is the change in entropy at . | | | | | | | |
| 264. | Standard molar heat enthalpy for converting carbon from graphite and diamond form into vapour state directly are 725 and 713 kJ respectively. The standard enthalpy change for polymorphism of 1g carbon is .. | | | | | | | |
| 265. | A certain amount of gas () in state is compressed to state . The final volume of state in is: | | | | | | | |
| 266. | The combustion of 5.0 g of coke raised the temperature of 1.0 g of water from 10°C to 55°C. If specific heat of water of 1 cal/g, the calorific value of coke is … | | | | | | | |
| 267. | At if enthalpy of fusion of ice is The molar entropy change for melting of ice at is…kcal. | | | | | | | |
| 268. | moles of reacts with sufficient water in an open vessel at The work done by the liberated gas is equivalent to What is ? | | | | | | | |
| 269. | Heat of solution of anhydrous is kcal and heat of hydration of anhydrous is kcal. The heat of solution of is ….. | | | | | | | |
| 270. | A reversible reaction is carried out at where its equilibrium constant is unity. If at is the value of is equal to … | | | | | | | |
| 271. | The enthalpy changes of some processes are given below .    The for | | | | | | | |
| 272. | One mole of an ideal gas is taken from to along two paths denoted by the solid and dashed line as shown in graph below. If the work done along the solid line is    and that along the dotted line path is then the integer closest to the ration is… | | | | | | | |
| 273. | Heat of combustion of a fuel mol. wt 86 is 688 kJ/mole. The calorific value of fuel is… .. | | | | | | | |
| 274. | The polymerization of propene to linear polypropene is represented by the reaction    Where has large integral value, the average enthalpies of bond dissociation for andat 298 K are +590 and respectively. The enthalpy of polymerization is . Find the value of | | | | | | | |
| 275. | of hypothetical is and for is. The enthalpy of disproportionation of is. Find the value of | | | | | | | |
| 276. | One mole of monoatomic ideal gas at bar and is compressed to 4 bar pressure following a reversible path obeying constant. Assume The value of for this process is minus. | | | | | | | |
| 277. | The enthalpy of transition of crystalline boron to amorphous boron at is . Assuming at. wt. of boron 10, the change in enthalpy of transition boron from crystalline to amorphous form is… | | | | | | | |
| 278. | Bond dissociation energy of , and (all diatomic molecules) are in the ratio of 1:1:05 and of XY is . The bond dissociation energy of is . Find the value of | | | | | | | |
| 279. | Amongst the following, the total number of reactions/processes in which the entropy increases are:  A liquid crystalline into a solid  Temperature of crystalline solid is raised from zero K to 100 K  Hard boiling of an egg  Devitrification of glass  Streching of a rubber band  Desalination of water | | | | | | | |
| 280. | Out of the following properties how many are path functions?  Heat enthalpy, internal energy, Temperature, Work, Heat, Specific heat | | | | | | | |
| 281. | If heat of formation of and are 191 and 97.5 kcal, the heat of reaction for is … | | | | | | | |
| 282. | The lattice energy of solid is and the enthalpy of solution of inis . If the hydration enthalpies of and ions are in the ratio of 2:1 then the enthalpy of hydration of is . Find the values of | | | | | | | |
| 283. | A heated iron block at loses 300 J of heat to the sourroundings which are at a temperature of . This process is . Find the value of | | | | | | | |
| 284. | Amongst the following, the total number of physical properties which are extensive are:  **a**. Density **b**. Viscosity **c**. Surface tension  **d**. Dipole moment **e.** Volume **f.** Refraction index  **g**. **h**. **i**. **j**. | | | | | | | |
| 285. | Amongst the following the total number of intensive physical properties  **a**. Density **b**. Viscosity **c**. Surface tension  **d**. Dipole moment **e.** Volume **f.** Refraction index  **g**. **h**. **i**. **j**. | | | | | | | |
| 286. | ofCyclohexene and benzene at is and , respectively. of cyclohexene at is  Resonance energy of benzene is found to be . Find the value of | | | | | | | |
| 287. | In the process:  for ice = for . Latent heat of fusion of ice at. The entropy change for the above process is  Give the total number of steps in which the third law of thermodynamics is used | | | | | | | |
| 288. | How much of the following are intensive properties? Vapour pressure, Molarity, Refractive index, Dielectric constant, Osmotic pressure, Molarity, Specific gravity, Molar volume | | | | | | | |
| 289. | The difference of for the given reaction is nRT. The value of n is … | | | | | | | |
| 290. | If and for the reaction : at are and . The for the reaction in is… | | | | | | | |
| 291. | 10 mL of dissolution of a strong acid on mixing with 10 mL of strong alkali at the same temperature shows a temperature rise of 4°C. if 50 mL of same acid are mixed with 50 mL of same alkali; the temperature rise will be …°C. Assume all the heat produced is used up in increasing temperature of mixture only. | | | | | | | |
| 292. | of and are and respectively. How much heat (in kJ) is given out during reaction of 1g according to | | | | | | | |
| 293. | A certain number of moles of gas is allowed to heat from to at constant By doing so gas is expanded to do work on boundries equivalent to How many moles of gas were used? | | | | | | | |
| 294. | The enthalpy change involved in the oxidation of glucose is 25% of this energy is available for muscular work. If 80 kJ of muscular work is needed to walk one km, what is the maximum distance that a person will walk after eating 120g glucose. | | | | | | | |
| 295. | For a gas the numerical value (in cal) of is equal to … | | | | | | | |

**ACTIVE SITE TUTORIALS**

**Date :** 20-08-2019 **TEST ID: 524**

**Time :** 17:36:00 **CHEMISTRY**

**Marks :** 1074

6.THERMODYNAMICS

|  |
| --- |
| **: ANSWER KEY :** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1) c 2) b 3) d 4) c**  **5) b 6) b 7) c 8) b**  **9) d 10) b 11) a 12) b**  **13) b 14) c 15) b 16) d**  **17) c 18) b 19) c 20) d**  **21) d 22) a 23) b 24) c**  **25) a 26) c 27) b 28) b**  **29) b 30) c 31) a 32) d**  **33) a 34) c 35) b 36) c**  **37) c 38) b 39) a 40) d**  **41) a 42) d 43) b 44) b**  **45) b 46) a 47) c 48) a**  **49) a 50) c 51) d 52) c**  **53) d 54) b 55) c 56) b**  **57) c 58) a 59) c 60) d**  **61) d 62) c 63) b 64) b**  **65) c 66) c 1) a,b,c,d 2) a,c 3) c, d, e 4) a, b, c, d**  **5) a,c,d 6) a,c 7) b, d 8) a, b, d**  **9) a,b,c 10) b,d 11) a,b,c,d 12) b,c**  **13) a,b,c 14) b,d 15) a,b 16) a, c**  **17) a, b, c, d 18) a,c 19) c,d 20) a,b**  **21) b,d 22) a,d 23) b,d 24) a,b,d**  **25) a,b,d 26) a,b,c 27) a,b 28) a, b, c**  **29) c, d, e 30) c, d 31) a, b, c, d 32) a, b, c**  **33) b, d 34) a, d 35) a, b, c 36) a,b,c**  **37) a, b 38) b, c 39) a,b 40) a, c**  **41) b, c, d 42) a, c, d 43) d 44) a, d**  **45) b,c 46) a, b, c 47) a, b 48) c, d**  **49) a,d 50) a,b 51) b,c,d 52) b,d**  **53) a,b 54) b,c,d 55) a,c 56) b,c,d**  **57) a,c 58) a,b,c,d 59) b,c,d 60) b,c,d**  **61) a,b,c 62) b,c 63) b,c,d 64) a, b, d**  **65) b,c,d 66) a, b, c, d 67) a,b,c 68) a, b, d**  **69) a,b 70) a,c,d 71) a,b,c 72) b,d**  **73) b,d 74) a,b,c,d 75) a, b, d 76) a,b,c**  **77) a, b 78) a,b,c 79) c, d 80) b, d**  **81) a,b,c 82) a,b,c,d 83) a,b,c 84) b, c, d**  **85) a, c 86) b,c,d 87) a,b,c,d 88) a, d**  **89) a,b 90) b,c,d 91) a,c 92) a,b,c,d**  **93) a 94) a,c 1) a 2) d 3) d 4) c**  **5) a 6) c 7) a 8) e**  **9) c 10) d 11) a 12) a**  **13) a 14) d 15) a 16) c**  **17) c 18) c 19) b 20) c**  **21) a 22) b 23) c 24) b**  **25) c 26) d 27) c 28) c**  **29) e 30) c 31) c 32) b**  **33) c 34) c 35) c 36) c**  **37) e 38) e 39) b 40) c**  **41) e 42) b 43) b 44) c**  **45) a 46) b 47) a 48) a**  **49) c 50) d 51) a 52) b**  **53) a 54) e 1) b 2) c 3) c 4) b**  **5) c 6) b 7) a 8) d**  **9) a 10) a 11) a 12) b**  **13) a 14) b 15) d 16) b**  **17) c 18) b 19) b 20) b**  **21) a 22) a 23) b 24) c**  **25) a 26) a 27) a 28) c**  **29) a 1) a 2) c 3) b 4) b**  **5) d 6) a 7) b 8) d**  **9) b 10) c 11) a 12) d**  **13) a 14) a 15) b 16) a**  **17) d 18) b 19) a 1) 6 2) 1 3) 1 4) 9**  **5) 5 6) 4 7) 3 8) 8**  **9) 5 10) 2 11) 8 12) 5**  **13) 8 14) 3 15) 2 16) 4**  **17) 4 18) 3 19) 4 20) 6**  **21) 5 22) 5 23) 5 24) 4**  **25) 2 26) 7 27) 6 28) 3**  **29) 4 30) 4 31) 6 32) 6**  **33) 2** | | | | |

**ACTIVE SITE TUTORIALS**

**Date :** 20-08-2019 **TEST ID: 524**

**Time :** 17:36:00 **CHEMISTRY**

**Marks :** 1074

6.THERMODYNAMICS

|  |
| --- |
| **: HINTS AND SOLUTIONS :** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | **(c)** | | | | | | | |
| 2 | **(b)** | | | | | | | |
| 3 | **(d)**  temperature of sink  temperature of the source | | | | | | | |
| 7 | **(c)** | | | | | | | |
| 8 | **(b)** | | | | | | | |
| 10 | **(b)** | | | | | | | |
| 12 | **(b)**  and | | | | | | | |
| 13 | **(b)**  At equilibrium, | | | | | | | |
| 14 | **(c)**  at temperature for one mole  at temperature for one mol | | | | | | | |
| 15 | **(b)**  In (b), | | | | | | | |
| 17 | **(c)**  Or | | | | | | | |
| 18 | **(b)** | | | | | | | |
| 20 | **(d)** | | | | | | | |
| 23 | **(b)**  in elementary state | | | | | | | |
| 25 | **(a)**  J | | | | | | | |
| 26 | **(c)** | | | | | | | |
| 27 | **(b)** | | | | | | | |
| 28 | **(b)**  By definition  For  Temperature does not change if some heat is given to the system. Hence | | | | | | | |
| 30 | **(c)**  J | | | | | | | |
| 31 | **(a)**  Dissociation of required energy | | | | | | | |
| 32 | **(d)**  Entropy of system depends upon Pressure, volume, and temperature | | | | | | | |
| 33 | **(a)**  constant | | | | | | | |
| 34 | **(c)**  [But all the species must be in gaseous state. In product, must be added  Hence, | | | | | | | |
| 35 | **(b)**  Evaporation of water required heat energy to proceed the reaction | | | | | | | |
| 36 | **(c)**  In thermodynamics, a process is called reversible when the surroundings are always in equilibrium with the system | | | | | | | |
| 37 | **(c)**  Combustion of one mole of reactants gives products in standard state or most stable state | | | | | | | |
| 41 | **(a)** | | | | | | | |
| 42 | **(d)**  In enthalpy of formation, reactants and products must be in most stable standard state | | | | | | | |
| 43 | **(b)**    kcal | | | | | | | |
| 45 | **(b)** | | | | | | | |
| 46 | **(a)** | | | | | | | |
| 47 | **(c)**  K | | | | | | | |
| 48 | **(a)**  Oxalic acid has two ionisable. Hence, expected heat of neutralization, if it behaves as a strong acid would have been  kcal  But experimental value =  Heat of ionization | | | | | | | |
| 49 | **(a)** | | | | | | | |
| 50 | **(c)**  **Activation energy**: is the energy that must be possessed by the molecules in excess to the average energy at a given temperature to enter a chemical reaction  Relation between activation energy and enthalpy of a reversible reaction  If the reaction is endothermic in forward direction, then  If the reaction is exothermic in forward direction  For an endothermic reaction, where represents the enthalpy of the reaction in , the minimum value for the energy of activation will be slightly more than | | | | | | | |
| 51 | **(d)**  Standard molar enthalpy of formation and the standard molar enthalpy of combustion of carbon (graphite) refer to the same chemical equation: | | | | | | | |
| 53 | **(d)**  27 g 51 g  0.624 mol ofon combustion gave=523 kJ  Hence false  Formation of 0.624 mol ofgave  Hence, false  0.312 mol of on combustion gave = 261 kJ. Hence, false  Formation of 0.150 mol ofgave. Hence, true | | | | | | | |
| 54 | **(b)** | | | | | | | |
| 55 | **(c)** | | | | | | | |
| 56 | **(b)** | | | | | | | |
| 57 | **(c)** | | | | | | | |
| 58 | **(a)**  All exothermic reactions are spontaneous, hence HF will attack | | | | | | | |
| 59 | **(c)**  Standard state implies to pressure and 298 K temperature | | | | | | | |
| 61 | **(d)** | | | | | | | |
| 62 | **(c)**  *(*volume of 1 g ) = 11.2 L at STP  (volume of 1 g ) = 22.4 L | | | | | | | |
| 63 | **(b)** | | | | | | | |
| 64 | **(b)**  kcal  kcal | | | | | | | |
| 65 | **(c)**  On comparison: | | | | | | | |
| 66 | **(c)**  In an ideal gas, there is no force of attraction between molecules. Hence, no heat is lost in the expansion | | | | | | | |
| 67 | **(a,b,c,d)**  Born-Haber cycle | | | | | | | |
| 72 | **(a,c)**  Mass-independent properties are extensive | | | | | | | |
| 75 | **(a,b,c)**  For a cyclic process,  Also, Area covered by sphere | | | | | | | |
| 76 | **(b,d)**  The quantities that do not depend upon the quantity or mass of a substance are called intensive properties | | | | | | | |
| 77 | **(a,b,c,d)**  In all these process heat of reaction changes | | | | | | | |
| 78 | **(b,c)**  *,* where number of moles) | | | | | | | |
| 81 | **(a,b)**  In isothermal process, and | | | | | | | |
| 84 | **(a,c)** | | | | | | | |
| 87 | **(b,d)**  ve for spontaneous process and at equilibrium. Statement (b) represents Carnot theorem | | | | | | | |
| 88 | **(a,d)**  constant ad constant  Helium and neon are monoatomic gases ,while oxygen is diatomic gas . Therefore, final temperature and pressure of both helium and neon are same | | | | | | | |
| 89 | **(b,d)**  Intensive property does not depend upon the mass of substance | | | | | | | |
| 90 | **(a,b,d)**  In conversion of solid ice to liquid and in rusting, the entropy increases | | | | | | | |
| 91 | **(a,b,d)**  In all these conversion, the degree of randomness decreases | | | | | | | |
| 92 | **(a,b,c)**  Mathematical relation | | | | | | | |
| 93 | **(a,b)**  for cyclic and isothermal process | | | | | | | |
| 102 | **(a,b,c)**  Heat is not a state function, while temperature is a state function. Heat flowing into the system is positive and heat flowing out of the system is negative | | | | | | | |
| 109 | **(d)**  Use Hess’ law | | | | | | | |
| 115 | **(a,d)**  Temperature and pressure are intensive properties | | | | | | | |
| 116 | **(a,b)**  For spontaneous process, and | | | | | | | |
| 117 | **(b,c,d)**  has more ordered arrangement. Also, | | | | | | | |
| 118 | **(b,d)**  The first law of thermodynamics states that , i.e., the internal energy of system is equal to the sum of heat and work | | | | | | | |
| 120 | **(b,c,d)**  All of these three are endothermic processes | | | | | | | |
| 121 | **(a,c)**  for mono-atomic is 1.66 | | | | | | | |
| 122 | **(b,c,d)**  In spontaneous process, and | | | | | | | |
| 125 | **(b,c,d)**  at equilibrium under standard state. Also, at equilibrium,  Also | | | | | | | |
| 127 | **(a,b,c)**  or | | | | | | | |
| 128 | **(b,c)**  . The process is sublimation as well conversion of crystalline allotropic from (graphite) to amorphous form (gas carbon) | | | | | | | |
| 129 | **(b,c,d)**  Mass-independent properties are intensive | | | | | | | |
| 131 | **(b,c,d)**  Entropy is greater in the liquid than in the solid state because molecules are held tightly in the solid. No. of molecules are decreasing on the product side in option (c) and (d) | | | | | | | |
| 133 | **(a,b,c)**  In (a), volume change is negligible while in (b) and (c), there is no volume change | | | | | | | |
| 135 | **(a,b)**  In adiabatic process, . Hence, in expansion process, temperature decreases and hence internal energy also decreases | | | | | | | |
| 137 | **(a,b,c)**  The sum of two extensive properties is always extensive while the ratio of extensive properties is intensive and the derivation is also intensive | | | | | | | |
| 138 | **(b,d)**  Let be the initial volume of dry air at NTP  We know,  During isothermal expansion, the temperature remains the same throughout. Hence, final temperature will be 273 K | | | | | | | |
| 139 | **(b,d)**  for spontaneous process must be negative. When or endothermic then to make. Temperature should be high | | | | | | | |
| 140 | **(a,b,c,d)**  and similarly  Also, | | | | | | | |
| 142 | **(a,b,c)**  The correct order is | | | | | | | |
| 144 | **(a,b,c)**  The multiplication of two intensive properties is an intensive property and their ratio and derivative is also an intensive property | | | | | | | |
| 147 | **(a,b,c)**  Hess’ law can be used for all these process or reaction | | | | | | | |
| 149 | **(a,b,c)**  In open system, heat and matter can be exchanged between system and surrounding | | | | | | | |
| 152 | **(b,c,d)**  In endothermic reaction, heat is absorbed by the system from the surroundings | | | | | | | |
| 153 | **(a,b,c,d)**  The heat of neutralization for strong acid and base is equal to or | | | | | | | |
| 158 | **(a,b,c,d)**  These are mathematically established facts | | | | | | | |
| 159 | **(a)**  Work is not a state function, but it is a path function | | | | | | | |
| 161 | **(a)**  Entropy is randomness. So, more the complexity of molecule, more will be its absolute entropy. That’s why benzene shows more entropy than which has also. More entropy than He | | | | | | | |
| 162 | **(d)**  No doubt is weak acid but the higher values are due to extensive hydration of ion being smallest anion (only is smaller than | | | | | | | |
| 163 | **(d)**  Work and heat are not state functions whereas is state function. | | | | | | | |
| 164 | **(c)**  Reason is correct explanation for statement. | | | | | | | |
| 165 | **(a)**  This is an application of Hess’s law and not an experimental proof. Hess’s law has been verified theoretically. | | | | | | | |
| 166 | **(c)**  Reason is correct explanation for statement.  and  Gaseous state has more disordered system. | | | | | | | |
| 167 | **(a)**  For cyclic process, . Energy is state function | | | | | | | |
| 169 | **(c)**  This is Trouton’s rule derived from exp. data. | | | | | | | |
| 170 | **(d)**  Both are facts. | | | | | | | |
| 171 | **(a)**  In adiabatic process, hence is expansion process temperature of the system decreases | | | | | | | |
| 172 | **(a)**  Heat of neutralization for strong acid and strong base is equal to and both are strong acid | | | | | | | |
| 173 | **(a)**  It is due to high bond energy of Note this equation does not represent heat of combustion of (partial combustion). | | | | | | | |
| 174 | **(d)**  Assertion is incorrect | | | | | | | |
| 176 | **(c)**  Explanation is correct reason for statement. | | | | | | | |
| 177 | **(c)**  Explanation is correct reason for statement. | | | | | | | |
| 178 | **(c)**  Explanation represents II law of thermodynamics. | | | | | | | |
| 179 | **(b)**  The heat of neutralization of strong acid and strong base is | | | | | | | |
| 180 | **(c)**  Explanation is correct reason for statement. | | | | | | | |
| 181 | **(a)**  Zeroth law of temperature can also be summarized as two objects at different temperature in thermal contact with each other tend to move towards the same temperature | | | | | | | |
| 182 | **(b)**  Phase transition occurs at constant and thus, change is referred as . | | | | | | | |
| 183 | **(c)**  Heat of formation of atom | | | | | | | |
| 184 | **(b)**  The reason is also an explanation for the name zeroth law. | | | | | | | |
| 185 | **(c)**  thus, unit is . | | | | | | | |
| 186 | **(d)**  Endothermic reaction requires heat energy to proceed in forward direction | | | | | | | |
| 187 | **(c)**  Reason is correct explanation for statement. | | | | | | | |
| 188 | **(c)**  Explanation is correct reason for statement. | | | | | | | |
| 189 | **(e)**  Enthalpy of element in most stable state is zero. Diamond is not a stable of carbon | | | | | | | |
| 190 | **(c)**  Exothermic reaction may also be accompanied with increase of entropy | | | | | | | |
| 191 | **(c)**  Spontaneous reaction may be negative also | | | | | | | |
| 193 | **(c)**  Reason is correct explanation is correct. | | | | | | | |
| 194 | **(c)**  Explanation is correct reason for statement. | | | | | | | |
| 195 | **(c)**  The entropy of formation cannot be zero | | | | | | | |
| 196 | **(c)**  For a spontaneous and if will be negative when . | | | | | | | |
| 199 | **(b)**  (Ideal gas) and (ideal gas)  Both are correct but reason is not the correct explanation | | | | | | | |
| 200 | **(c)**  Calorific value is defined as the heat given out by burning 1 g fuel.  Calorific value for  Calorific value for | | | | | | | |
| 202 | **(b)**  On increasing temperature, the endothermic reaction becomes spontaneous and entropy also increases | | | | | | | |
| 203 | **(b)**  Dissociation of water is is reverse of the heat of neutralization and the value of heat is equal but sign is reverse | | | | | | | |
| 204 | **(c)**  For a spontaneous process, must be negative | | | | | | | |
| 205 | **(a)**  The properties whose magnitude depends upon the quantity of matter present in the system are called extensive properties , internal energy | | | | | | | |
| 206 | **(b)**  Graphite is most stable state of carbon, hence its energy is lower than that of diamond and entropy of graphite is also lower than that of diamond | | | | | | | |
| 208 | **(a)**  It is fact that absolute values of internal energy of substance can not be determined. It is also true that to determine exact values of constituent energies of the substance is impossible | | | | | | | |
| 209 | **(c)**  Explanation is correct reason for statement. | | | | | | | |
| 210 | **(d)**  For isothermal expansion Also because and Also volume occupied by molecules is zero for ideal gas. Thus, both are assertion and reason are correct, but this is not an explanation for assertion. | | | | | | | |
| 211 | **(a)**  Heat of formation of water is | | | | | | | |
| 212 | **(b)**  The mass and volume depend upon the quantity of matter so these are extensive properties while ratio of mass to its volume does not depend upon the quantity of matter so this ratio is an extensive property | | | | | | | |
| 213 | **(a)**  Kirchhoff’s equation is | | | | | | | |
| 216 | **(c)**  (**ap,q**) Specific heat = Amount of heat required to raise temperature of 1 mol substance  (**bq,p**) or or  (**cs**)  (**dr**) | | | | | | | |
| 217 | **(c)**  (**ar**) Enthalpy is a states function and is a function of internal energy and pressure and volume  (**bp**) Temperature is independent of the bulk matter of the system and hence it is a intrinsic property but it is a state variable  (**cr**) Free energy is a state function as it depends on the state of the system as well as it depends on and . It is also a function of  (**dq**) Work is a path function as the amount of work | | | | | | | |
| 218 | **(b)**  (**a→q**) is according to second law of thermodynamics. It states entropy of universe is continuously increasing due to spontaneous processes taking place in it  (**br**) if , the process is non-spontaneous. mean for a spontaneous process  (**cs**)  (**dp**) i.e., useful work done by the system  i.e., decrease in free energy is measure of useful work done by the system | | | | | | | |
| 219 | **(c)**  (**as**) (Gibbs-Helmholtz reaction)  (**br**)  (**cq**)  (**dp**) | | | | | | | |
| 220 | **(b)**  (**ap,r**) In isothermal process, or  (**bs**) In adiabatic process,  (**cq**) In free expansion,  (**dq**) In free expansion, | | | | | | | |
| 222 | **(d)**  (**ap,q**) At equilibrium and for spontaneous process  (**bq**) Entropy decreases because in formation of product number of moles decrease  (**cq,r**)  (**dq,s**) | | | | | | | |
| 224 | **(a)**  (**a→r**) , Gibbs free energy is negative and it favours the reaction to occur spontaneously  (**b→s**) Endothermic reaction  Therefore,  (**cp**) Bond enthalpy  (**dq**) For solid and liquid | | | | | | | |
| 225 | **(a)**  (**as**) Hess’ law states that enthalpy change in a reaction remains the same whether the reaction takes place in one step or in several steps  (**br**) Combustion reactions are exothermic  (**cq**)  (**dp**)  It is Clausius-Clapeyron equation | | | | | | | |
| 227 | **(a)**  (**ap,q**) and  (**bp,r**) or and  (**cp**)  (**ds**) | | | | | | | |
| 228 | **(b)**  (**at**) For ideal gas,  (**br**) In adiabatic process, . Therefore, from the first law of thermodynamic, and  (**cp**) In isothermal process, because internal energy is the function of temperature  (**dq**)  (**es**) for real gases | | | | | | | |
| 229 | **(d)**  (**a→p,r**) Kirchoff’s equation  (**b→q,r**)  (**cp**)  (**ds**) The third law of thermodynamics states that at absolute zero the entropy of a perfectly crystalline substance is zero | | | | | | | |
| 231 | **(c)**  (**as**)  (**br**) Kirchoff’s equation relate the variation of enthalpy with temperature  (**cp**) For ideal gas,  (**dq**) Inversion temperature, | | | | | | | |
| 232 | **(b)**  (**aq)**  (**bp,r**)  (**cp,r**)  (**d p,r,s**) Kirchoff’s relation | | | | | | | |
| 234 | **(b)**  (**as**)  For an ideal gas  But for isothermal expansion/compression of ideal gas,  and constant for isothermal change  (**bp,r**) for hydrogenation and also for non-ideal solutions with negative deviation  (**cq**) For a reversible process  For any process  (**dr**)  during mixture | | | | | | | |
| 235 | **(a)**  (**aq**)  ( number of moles)  (**bq**)  (**cp**)  (**dr,s**) | | | | | | | |
| 236 | **(a)**  (**ap**) For non spontaneous process, photochemical reaction  (**bp,q**) For spontaneous process, or but in photochemical reaction (non-spontaneous).  (c**r**) At equilibrium,  (**ds**) For non spontaneous process, | | | | | | | |
| 237 | **(b)**  (**aq**) For exothermic reaction,  (**br**) For endothermic reaction,  (**cs**) For spontaneous process,  (**dp**) | | | | | | | |
| 240 | **(a)**  (**as**) Whenever internal energy of a system decreases, then the temperature always decreases  In an adiabatic expansion work is done by the gas  is  Temperature decreases  (**br**) For an ideal gas,  (**cq**) Whenever internal energy increases temperature of the system increases  (**dp**) During resonance,  In where resonance takes place | | | | | | | |
| 241 | **(a)**  (**aq**) To initial reaction, activation energy must be invested  (**bp**)  (**cr**) In endothermic reaction or ) heat absorbed by system  (**ds**) In exothermic reaction or ) heat releases out from system to surroundings | | | | | | | |
| 242 | **(c)**  (**ap,r**) In isothermal process  Or or  (**bq**) Adiabatic process ( constant)  (**cq**) Mathematical relationship  (**ds**) | | | | | | | |
| 244 | **(a)**  bar-L | | | | | | | |
| 245 | **(c)**  cal  cal  Thus, gas is monatomic | | | | | | | |
| 246 | **(b)**  ,at high temperature factor dominates of and hence becomes negative and reaction occurs spontaneously | | | | | | | |
| 247 | **(b)**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  On addition  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | | | | |
| 248 | **(d)**  According to the first law of thermodynamics  In isothermal process,  Or | | | | | | | |
| 249 | **(a)**  (for 1 mol)  For 1 kg  Number of moles  Heat change for 5.81 mol of | | | | | | | |
| 250 | **(b)**  Work in reversible isothermal expansion is greater than work done in adiabatic expansion | | | | | | | |
| 251 | **(d)**  andboth favour the process | | | | | | | |
| 252 | **(b)**  Expansion from state to state occurs at constant pressure (isobaric expansion) | | | | | | | |
| 253 | **(c)**  In expansion of gas molecule, entropy of increases or and entropy of surrounding decreases | | | | | | | |
| 256 | **(a)**  Fluorine is more electron-negative than oxygen and oxygen is more electro-negative than nitrogen and hence bond energy between in greater than which is greater than | | | | | | | |
| 257 | **(a)** | | | | | | | |
| 258 | **(b)**  Isochoric process | | | | | | | |
| 259 | **(a)**  In adiabatic process,  and | | | | | | | |
| 260 | **(d)**  Work done=Area under curve | | | | | | | |
| 261 | **(b)**  If then only . | | | | | | | |
| 262 | **(a)**  Heat released during neutralization of weak acid in hydration of ion is responsible for higher value. | | | | | | | |
| 274 | **(5)**  Energy released = Energy due to formation of two single bonds  of propene  polymerization/mol =  polymerisation | | | | | | | |
| 275 | **(8)** | | | | | | | |
| 278 | **(4)**  Let the bond dissociation energy of andbe(the given ration) , respectively | | | | | | | |
| 279 | **(4)**  Entropy increases in (a), (c ), (d) and (h) | | | | | | | |
| 282 | **(6)**  Let the enthalpy of hydration of is  of | | | | | | | |
| 283 | **(5)**  or | | | | | | | |
| 284 | **(5)**  Extensive properties which depends on mass are (e), (g), (h), (i) and (j) | | | | | | | |
| 285 | **(5)**  Intensive properties are independent on mass. (a), (b),(c),(d) and (f) | | | | | | | |
| 286 | **(4)**    This shows that the generation of one bond in cyclohexane requires 119 of enthalpy. To calculate RE resonance energy    From Hess’ law | | | | | | | |
| 287 | **(2)**  **Step 1. (using the third law of thermodynamics):**  (For changing  **Step 2 (using the second law of thermodynamics):**  **Step 3(using the third law of thermodynamics):** | | | | | | | |