CHEMISTRY

BOOKS - NIKITA CHEMISTRY (HINGLISH)

Chemical Thermodynamics & Energetics

MULTIPLE CHOICE QUESTIONS

1. Which one is not a state function ?

    A. Internal energy

    B. Volume

    C. Heat (q)

    D. Enthalpy

Answer: C

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2. Thermodynamics is concerned with

A. total energy of a system

B. energy changes in a system

C. rate or chemical change

D. mass changes in nuclear reactions

Answer: B

3. When no heat energy is allowed to enter or leave the system, it is called

A. Isothermal process

B. Reversible process

C. Adiabatic process

D. Irreversible process

Answer: C

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4. The information not conveyed by thermodynamics is about

A. spontaneity of a reaction

B. yields of the products formed

C. rates of reactions

D. all the three above

Answer: C

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5. Warming ammonium chloride with sodium hydroxide in a test tube is an example of :

    A. closed system

    B. isolated system

    C. open system

    D. none of these

Answer: C

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6. Which is the intensive property

    A. Temperature

    B. Viscosity

    C. Viscosity

    D. All

Answer: D

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7. A system which can exchange energy with the surroundings but no matter is called

A. a heterogeneous system

B. an open system

C. closed system

D. an isolated system.

Answer: C

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8. An adiabatic process is one is which

A. the system is not closed to energy transfer

B. the system is not closed to heat transfer

C. there is no enthalpy change

D. there is no change in mass of the system

Answer: C

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9. When an ideal gas is compressed adiabatically and reversibly, the final temperature is:

A. higher than the initial

B. lower than the initial temperature

C. the same as the initial temperature

D. dependent on the rate of compression

Answer: A

10. An intensive property in thermodynamics means a property which depends

    A. `on the amount of the substance only

    B. on the nature of the substance only

    C. both on the amount as well as nature of the substance

    D. neither on the amount nor on the nature.

Answer: B

11. The final temperature in an adiabatic expansion is

    A. greater than the initial temperature

    B. same as the initial temperature

C. half of the initial temperature

D. less than the initial temperature

Answer: D

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12. In an adiabatic process

A. the system exchanges heat with surroundings

B. pressure is maintained constant

C. there is perfect heat insulation

D. the gas is isothermally expanded

Answer: C

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13. Which of the following statements is correct ?

A. Internal energy is a state function but work is not

B. Work is a state function but internal energy is not

C. Both internal energy and work are state functions

D. Neither internal energy nor work is a state function.

Answer: A

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14. In which of the following sets, all properties belong to same category (all extensive or all intensive) ?

A. mass, volume, pressure

B. temperature, pressure, volume

C. heat capacity, density, entropy

D. enthalpy, internal energy, volume.

Answer: D

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15. An endothermic reaction is one in which:

A. heat is liberated

B. heat is absorbed

C. temperature remains constant

D. none

Answer: B

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16. Which among the following is not a state function?

A. Internal energy

B. Entropy

C. Work

D. Enthalpy

Answer: C

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17. The temperature of the system decreases in an

A. adiabatic expansion

B. isothermal compression

C. isothermal expansion

D. adiabatic compression

Answer: A

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18. Whicn one is true ?

A. $1cal$ or $ie > 1erg > 1joe$

B. $1erg > 1cal$ or $ie > 1joe$

C. 1 caloriegt 1 joulegt 1 erg

D. 1 joule gt 1 calorie gt 1 erg

Answer: C

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19. An adiabatic process in which

A. $q = + W$

B. $q = 0$

C. $\Delta U = q$

D. $P\Delta V = 0$

Answer: B

20. which among the following is intensive quantity ?

    A. Freezing point

    B. Temperature

    C. Refractive index

    D. All

Answer: D

21. Which is an extensive property of the system ?

    A. Temperature

B. Mass

C. Refractive index

D. Normality

Answer: B

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22. An open system is that system in which

A. there is not exchange of energy with the msurroundings

B. there is exchange of mass and energy with the surroundings

C. there is no exchange of mass or energy with the surroundings

D. there is exchange of mass with the surroundings

Answer: B

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23. Which among the following state functions is an extensive property of the system?

A. Temperature

B. Mass/density

C. Refractive index

D. Viscosity

Answer: B

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24. A living system is an example of

A. Closed system

B. Open system

C. Isolated system

D. None

Answer: B

25. Which of the following have same units?

(i) Work

(ii) Heat

(iii) Energy

(iv) Entropy

    A. i), ii) and iii)

    B. i), ii) and iv)

    C. ii), iii) and iv)

    D. iii) and iv)

Answer: A

26. When a gas is subjected to adiabatic expansion, it gets cooled due to :

A. fall in temperature

B. loss of kinetic energy

C. decrease in velocity

D. loss of potential energy

Answer: A

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27. A gas expands isothermally and reversibly. The work done by the gas is

A. Zero

B. Maximum

C. Minimum

D. Cannot be determined

Answer: B

28. The process in which pressure remains constant throughout a change is

    A. adiabatic

    B. isochoric

    C. isobaric

    D. isothermal

Answer: C

29. A thermodynamic quantity is that

A. which is used in thermochemistry

B. which obeys all the Jaws of thermodynamica

C. quantity which depends only on the state of system

D. quantity which is used in measuring thermal

Answer: B

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30. The temperature of the system increases during an

A. isothermal expansion

B. adiabatic compression

C. adiabatic expansion

D. isothermal compression

Answer: B

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31. Which one is extensive property ?

    A. Mass

    B. Mole

    C. Volume

    D. All

Answer: D

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32. Which one of the following systems is an example of a closed system ?

    A. hot water present in an open beaker ·

    B. some amount of water present in equilibrium with its vapour in a

       closed and insulated breaker

C. some amount of hot water enclosed in a closed container which is

  not insulated

D. none

Answer: C

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33. During isothermal expansion of an ideal gas, its internal energy

  A. decreases

  B. increases

  C. may increase or decrease

  D. remains unchanged.

Answer: D

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34. An example of closed system is

    A. hot liquid in an open beaker

    B. water in heater

    C. hot liquid in a sealed insulated beaker

    D. none

Answer: B

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35. In an isothermal expansion of an ideal gas

    A. q = 0

    B. $\Delta V = 0$

    C. W=0

    D. $\Delta U = 0$

Answer: D

36. A gass expands in vacuum. The work done by the gas 1s

A. zero

B. minimum

C. maximum

D. equal to work done

Answer: A

37. Temperature and heat are

A. extensive properties

B. intensive properties

C. intensive and extensiv properties respectively

D. extensive and intensive properties respectively

Answer: C

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38. A well stoppered thermos flask contains tea. This is an example of a

A. closed system

B. ` open system

C. isolated system

D. non-thermodynamic system.

Answer: C

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39. An isolated system is that system in which

A. there is no exchange of energy with the surroundings

B. there is exchange of mass and energy with the surroundings

C. there is no exchange of mass and energy with the surroundings

D. there is exchange of mass with surroundings.

Answer: C

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40. If temperature remains constant during a reaction the process is called

A. isothermal

B. isochoric

C. isobaric

D. adiabatic

Answer: A

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41. Which is not a spontaneous process

    A. expansion of a gas into vacuum

    B. water flowing down hill

    C. heat flowing from colder body to a hotter body

    D. evaporation of water from clothes during drying

Answer: C

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42. Universe is an example of

    A. open system

B. closed system

C. isolated system

D. none

Answer: C

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43. Which of the following is a closed system ?

A. Jet engine

B. Coffee placed in a steel kettle

C. Pressure cooker

D. Rocket engine during propulsion.

Answer: B

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44. A gaseous system changes from state $A(P_1, V_1, T_1)$ to $B(P_2, V_2, T_2)$, B to $C(P_3, V_3, T_3)$ and finally from C to A. The whole process may be called

A. Reversible process

B. Cyclic process

C. Isoba ri c process

D. Spontaneous process

Answer: B

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45. An example of ex tensive property is

A. Temperature

B. Int ernal energy

C. Viscosi ty

D. Molar hea l capacity

Answer: B

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46. Which of following is co rrect mat ch as far as the thermodynami c processes are involved ?

Curve		Thermodynamic process
1	i	Adiabatic
2	ii	Isochoric
3	iii	Isobaric
4	iv	Isohtermal

A.

1	2	3	4
i	ii	iii	iv

B.

1	2	3	4
iii	iv	i	ii

C.

1	2	3	4
ii	i	iv	iii

D.

1	2	3	4
iii	iv	ii	i

Answer: B

47. Cooling of a gas in an adiabatic expansion is due to

    A. fall in temperature

    B. energy spent in doing work

    C. energy is not spent in doing the work

    D. loss of energy to the surroundings

Answer: B

48. When two atoms of a diatomic gas combine to form a molecule of the gas, the energy of molecule is

    A. equal to that of two separate atoms

    B. greater than that of two separate atoms

C. lower than that of two separate atoms

D. double the energy of the atom

Answer: C

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49. All irreversible processes are

A. non spontaneous

B. in equilibrium

C. isothermal

D. spontaneous

Answer: D

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50. If $q = \Delta U -$ by first law of thermodynamics then for an adiabatic process

A. $W = \Delta U$

B. $\Delta U = 0$

C. $q = \Delta U$

D. $W = 0$

Answer: A

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51. First law of thermodynamics introduces concept of

A. temperature

B. pressure

C. change of direction of reaction

D. conservation of energy

Answer: D

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52. ΔU for a system that does 1000 cals of work on the surroundings when 200 cals of heat are absorbed by the system is

A. - 1200 cals

B. + 1200 cals

C. + 800 cals

D. - 800 cals

Answer: D

---

53. According to latest sign conventions, the correct expression representing the first la of thermodynamics is

A. $\Delta U = q + W$

B. $\Delta U = \Delta H + PV$

C. $q = \Delta U$

D. $W = 0$

Answer: A

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54. The mathematical form of the first law of thermodynamics when heat (q) is supplied and W is work done by the system is

A. $q = \Delta U - W$

B. $\Delta U = q - W$

C. $\Delta U = -q + W$

D. $\Delta U = -q - W$

Answer: B

55. Identify the state quantiy among the following

    A. q

    B. q-W

    C. q/W

    D. q + W

Answer: D

56. Work done equivalent to 1 J and 1 cal, 1 L atm are in order

    A. 1 L. atm gt 1 J gt lcal

    B. 1 L. atm gt 1 calgt 1 J

    C. 1 cal gt 1 J gt 1 L. atm

D. 1 J gt 1 cal gt 1 L. atm

Answer: B

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57. The work done by a weightless piston in causing an expansing ΔV (at constant temperature), when the opposing pressure P is variable, is given by :

A. $W = -\int P\Delta V$

B. $W = 0$

C. $W = -P\Delta V$

D. None

Answer: A

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58. Work done in a reversible expansion is

A. $\Delta P \cdot \Delta V$

B. $P \cdot \Delta V$

C. $q - \Delta V$

D. $\displaystyle\int_{V_2}^{V_1}$

Answer: D

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59. The work done by a system in an expansion against a constant external pressure is

A. $\Delta P \cdot \Delta V$

B. $-P \cdot \Delta V$

C. $V \cdot \Delta P$

D. q

Answer: B

60. Which of the following units represent the largest amount of energy?

   A. calorie

   B. joule

   C. erg

   D. electron volt

Answer: A

61. Work done by the system on surroundings is :

   A. Positive

B. Negative

C. Zero

D. None

Answer: B

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62. Work done in reversible isothermal process is given by

A. $-2.303 \; nRT \; \log \dfrac{V_2}{V_1}$

B. $\dfrac{nR}{y-1}(T_2 - T_1)$

C. $-2.303 \; nRt \; \log \dfrac{V_2}{V_1}$

D. $+2.303 \; nRt \; \log \dfrac{V_2}{V_1}$

Answer: A

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63. If a refrigerator door is kept open, then we get

    A. room cooled

    B. room heated

    C. more heat is passed out

    D. no effect on room

Answer: B

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64. W grams of a gas expands isothermally and 'bly at a given temperature T from a volume The order of amount of work will be V_1 to V_2 ing these gases as ideal gases) (assum

    A. $N_2 > O_2 > CO_2 > CH_4$

    B. $O_2 > CH_4 > N_2 > CO_2$

    C. $CO_2 > N_2 > O_2 > CH_4$

D. $CO_2 < O_2 < N_2 < CH_4$
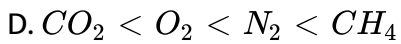
Answer: D

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65. When heat is released during the reaction, it is denoted as _____ and when work is done on system by the surroundings, it is denoted as _____ .

    A. Positive : positive

    B. negative , negative

    C. ositive , negative

    D. negative ' positive

Answer: D

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66. If one mole of a gas occupying y L volume is expanded against a constant external pressure of one atmosphere to a volume of x L, the work done by the system is _____.

A. $-p(x + y)$

B. $-p(x - y)$

C. $-p\left(\dfrac{x}{y}\right)$

D. $= -\dfrac{p}{x - y}$

Answer: B

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67. Five joule equals

i) $5\,N \times m$

ii) $5x10_7$ ergs

iii) 1.195 cals

A. i) and ii) only

B. i) and iii) only

C. ii) and iii) only

D. i), ii) and iii)

Answer: D

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68. A gas expands in vacuum, the work done by the gas is

A. zero

B. minimum

C. maximum

D. equal to the work done on the gas

Answer: A

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69. 10 moles of an ideal gas are compressed isothermally and reversibly at 200°C from a pressure of 1 atm to a pressure of S atm. Then

A. $\Delta U = 0,\ \Delta H = 0$

B. $\Delta U \neq 0,\ \Delta H = 0$

C. $\Delta U = 0,\ \Delta H \neq 0$

D. $\Delta U \neq 0,\ \Delta H \neq 0$

Answer: C

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70. In a reversible isothermal expansion of ideal gas, the work done is given by the expression

A. $nRT\dfrac{\ln(V_1)}{V_2}$

B. $-nRT\dfrac{\ln(P_1)}{P_2}$

C. Both a and b

D. $P\Delta V$

Answer: C

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71. The neon gas always possesses

A. rotational energy only

B. vibrational energy

C. translational energy

D. none of these

Answer: D

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72. Internal energy does NOT include

A. vibrational energy

B. rotational energy

C. gravitational energy

D. nuclear energy

Answer: C

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73. In internal energy, the kinetic energy component consist of which of the following ?

i) translational energy

ii) vibrational energy

iii)rotational energy

iv) gravitational energy force

A. iii) and iv)

B. i), ii) and iii)

C. i), ii) and iv)

D. i), ii), iii) and iv)

Answer: B

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74. Which of the following statements is incorrect about internal energy?

A. The absolute value of internal energy cannot be determined

B. The internal energy of one mole of a substance is same at any temperature or pressure

C. The measurement of heat change during a reaction by bomb calorimeter is equal to the internal energy change

D. Internal energy is an extensive property.

Answer: B

75. During isothermal expansion of an ideal gas its

    A. internal energy increases

    B. enthalpy decreases

    C. enthalpy remains unaffected

    D. enthalpy reduces to zero.

Answer: C

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76. At constant T and P, which one of the following statements is correct for the reaction ice................ water

    A. $\Delta H < \Delta U$

    B. $\Delta h = \Delta U$

    C. $\Delta H > \Delta U$

D. ΔH is independent of the physical state of the reactants.

Answer: B

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77. In a reaction, if $\Delta U < 0$, then the heat

    A. change is zero

    B. is absorbed

    C. is evolved

    D. change is abnormal

Answer: C

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78. A liquid is in equilibrium with its vapour at its boiling point . On an average the molecules in the two phases have equal :

A. Internal molecular forces

B. Potential energy

C. total energy

D. Kinetic energy

Answer: D

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79. Internal energy of an ideal gas depends on :-

A. Pressure

B. Temperature

C. Volume

D. None

Answer: B

80. The apparatus generally used for measuring heat changes is

    A. Voltameter

    B. Voltmeter

    C. Calorimeter

    D. Coulometer

Answer: C

81. It is a general principle that the less energy of a system then it is

    A. more stable

B. less stable

C. unstable

D. more unstable

Answer: A

82. The mode of energy constituting both kinetics energy and potential energy is

A. Nuclear energy

B. Translational energy

C. Rotational energy

D. Vibrational energy

Answer: D

83. Vibrational energy is not shown by

    A. Inert gases

    B. Halogens

    C. both

    D. none

Answer: A

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84. A reaction take place with absorption of energyis

    A. Burning of a candle

    B. Electrolysis of water

    C. Digestion of food

    D. Rusting of iron

Answer: B

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85. All the naturally occuring processes proceed spontaneously in a direction which leads to

    A. Decrease of free energy (ΔG)

    B. Increase of free energy (ΔG)

    C. Decrease of entropy (ΔS)

    D. Increase of enthalpy (ΔH)

Answer: A

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86. For which process energy will be absorbed

A. separation of an electron from an electron

B. separation of proton from a proton

C. separation of a neutron from neutron

D. separation of an electron from a neutral atom

Answer: D

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87. Two atoms of hydrogen combine to form a molecule of hydrogen gas, the energy of the H_2 molecule is :

A. greater than that of separate atoms

B. equal to that of separate atoms

C. lower than that of separate atoms

D. sometimes lower and sometimes higher

Answer: C

88. Internal energy of a system containing molecules is reported as

    A. kinetic energy

    B. vibrational energy

    C. rotational energy

    D. all kinds of energy associated with it

Answer: D

89. A system is changed from state A to state B by one path and from B to A by another path. If ΔE_1 and ΔE_2 are the corresponding changes in internal energy, then

    A. $U_1 + U_2 = + ve$

B. $U_1 + U_2 = -ve$

C. $U_2 - U_1 = 0$

D. $U_2 + U_1 = 0$

Answer: C

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90. During isothermal transformation of an ideal gas, internal energy

A. increases as the pressure increases

B. decreases as the volume decreases

C. decreases as the pressure decreases

D. remains fixed

Answer: D

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91. During an isothermal expansion of an ideal gas its

    A. enthalpy decreases

    B. internal energy decreases

    C. internal energy increases

    D. internal energy remains constant

Answer: D

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92. In a reversible isothermal process, the change in internal energy is :

    A. zero

    B. positive

    C. negative

    D. none

Answer: A

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93. The internal energy of one mole of a gas is

A. $\dfrac{3}{2}RT$

B. $\dfrac{KT}{2}$

C. $\dfrac{RT}{2}$

D. $\dfrac{3KT}{2}$

Answer: A

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94. A thermally isolated gaseous system can exchange energy with the surroundings. What is the mode of transference of energy ?

A. heat

B. work

C. heat and radiation

D. none of these

Answer: B

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95. A reaction accompanied with the liberation of energy is

A. urea + water

B. $NH_2Cl + H_2O$

C. electrolysis of water

D. digestion of food

Answer: D

96. When a liquid boils, there is an increase in

    A. free energy

    B. kinetic energy

    C. potential energy

    D. heat of vaporisation

Answer: B

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97. The process of evaporation of a liquid is accompanied by

    A. increase in enthalpy

    B. decrease in enthalpy

    C. no change in enthalpy

D. a) orb)

Answer: A

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98. Enthalpy is same

A. heat content

B. entropy

C. heat

D. volume

Answer: A

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99. The enthalpy change for the process C(s) $\Rightarrow$ C(g) corresponds to enthalpy of

A. fusion

B. vaporisation

C. combustion

D. sublimation

Answer: D

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100. During the evaporation of a liquid,

A. the enthalpy decreases

B. the enthalpy increases

C. the enthalpy remains unchanged

D. the internal energy decreases

Answer: B

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101. For the process, melting of ice at 260 K, the ΔH is

A. negative

B. positive

C. zero

D. cannot be predicted

Answer: B

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102. Which statements are correct :

A. $\Delta H = \Delta U + \Delta nRT$

B. $\Delta H = \Delta U + P\Delta V$

C. $\Delta H^{\circ} = \Sigma\Delta_f H^{\circ}_{(P)} - \Sigma\Delta_f H^{\circ}_{(R)}$

D. All

Answer: D

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103. Which of the following is not correct about enthalpy ?

A. It is an extensive property

B. It is not a state function

C. Its absolute value cannot be determined

D. Enthalpy of a compound= Enthalpy of formation of that compound.

Answer: B

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104. An ideal gas undergoing expansion in vacuum shows:

A. $\Delta U = 0$

B. $W = 0$

C. q=0

D. All

Answer: D

105. Which of the following state function is not zero at standard state :-

A. enthalpy

B. entropy

C. free energy

D. entropy and enthalp

Answer: B

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106. A system absorbs 10 kJ of heat and does 4 kJ of work the internal energy

A. decreases

B. increases

C. same

D. none

Answer: B

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107. In which one of the following cases, ΔH and ΔU are not equal to each other?

A. The reaction involves no gaseous reactant or product

B. The number of moles of gaseous reactants and gaseous products 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 a closed vessel.

Answer: B

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108. The heat measured for a reaction in a bomb calorimeter is

A. ΔG

B. ΔH

C. ΔU

D. $P\Delta V$

Answer: C

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109. The heat change in a chemical reaction at constant pressure is

A. ΔU

B. $P\Delta V$

C. ΔH

D. ΔV

Answer: C

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110. In the balanced equation for the combustion of 1 mole of benzoic acid, C6H 5COOH(s) at temp. T, the difference between enthalpy change and internal energy change is equal to

A. $-\dfrac{RT}{2}$

B. $\dfrac{-3}{2}RT$

C. $\dfrac{5}{2}RT$

D. $\dfrac{RT}{2}$

Answer: A

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111. If ΔH is the enthalpy change and ΔU the change in internal energy accompanying a gaseous reaction, then

A. ΔH is always grater than ΔH

B. $\Delta H < \Delta U$ only if the number of moles of the products is grater than the number of moles of the reactants

C. ΔH is always less than ΔU

D. $\Delta H < \Delta U$ only if the number of moles of products is less than the number of moles of the reactants.

Answer: D

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112. For the reaction

$$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g), \Delta H = ?$$
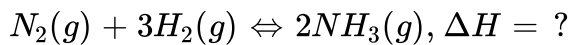
A. $\Delta U + 2RT$

B. $\Delta U - 2RT$

C. $\Delta + RT$

D. $\Delta U - RT$

Answer: B

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113. If ΔH is the enthalpy change and ΔU the change in internal energy accompanying a gaseous reaction, then

A. $\Delta H = \Delta U$

B. $\Delta H < \Delta U$

C. ΔH is always less than ΔU

D. $\Delta H < \Delta U$ only if the number of moles of solid products is less than gaseous reactants

Answer: A

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114. ΔH is ΔU for those reactions which take place with increase in volume

A. greater than

B. lesser than

C. equal to

D. information insufficient

Answer: D

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115. A mixture of two moles of CO and mole of O_2 in a closed vessel is ignited to convert CO into CO_2 Then,

A. $\Delta H - \Delta U = 0$

B. $\Delta H - \Delta U > 0$

C. $\Delta H - \Delta H < 0$

D. the relationship depends upon the capacity of the vessel

Answer: C

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116. At constant temperature and pressure, which one of the following statement is TRUE for the reaction given below ?

$$C_S + O_{2(g)} \rightarrow CO_{2(g)}$$
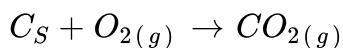
A. $\Delta H = \Delta U$

B. $\Delta H - \Delta U > 0$

C. $\Delta H - \Delta U < 0$

D. $\Delta H = 0, \Delta U \neq 0$

Answer: A

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117. Which unit represents smallest amount of energy

A. calorie

B. joule

C. erg

D. electron-volt

Answer: D

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118. For which change $\Delta H \neq \Delta E$:-

A. $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$

B. $HCl_{(l)} + NaOH_{(l)} \rightarrow NaCl_{(l)} + H_2O_{(l)}$

C. $C(s) + O_2(g) \rightarrow CO_2(g)$

D. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
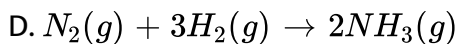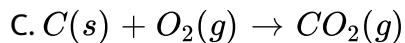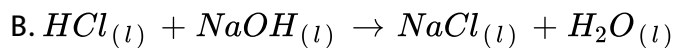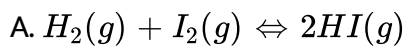
Answer: D

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119. Which of the following statements is true ?

A. ΔH is positive for exothermic reactions

B. ΔH is negative for endothermic reactionsThe enthalpy of fusion is

negative

C. The enthalpy of fusion is negative

D. The enthalpy of neutralization of strong acid with strong base is

always the same

Answer: D

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120. The Enthalpy of formation is the change in enthalpy accompanying

the formation of a substance from its elements at 298 K and 1 atm

pressure. Since the enthalpies of elements in their most stable state are

taken to be zero, the enthalpy of formation of compunds is

A. always negative

B. always positive

C. standard heat enthalpy of that compound

D. zero

Answer: C

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121. Enthalpy of element is equal to the

A. $\Delta_c H^\circ$

B. $\Delta_r H^\circ$

C. $\Delta_f H^\circ$

D. All

Answer: C

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122. Heat exchanged in a chemical reaction at constant temperature and pressure is called

    A. free energy

    B. internal energy

    C. enthalpy

    D. bond energy

Answer: C

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123. Enthalpy change during a reaction does not depend upon

    A. conditions of a reaction

    B. initial and final concentration

    C. physical state of reactants and products

    D. number of steps in the reaction

Answer: D

---

124. At constant P and T which statement is correct for the reaction,

$$N_2(g) + O_2(g) \rightarrow 2NO(g)$$

A. $\Delta H = \Delta U$

B. $\Delta H < \Delta U$

C. $\Delta H > \Delta U$
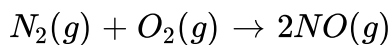
D. ΔH is independent for physical state of reactant

Answer: A

---

125. The difference between ΔH and ΔU is equal to

A. R

B. $P\Delta V$

C. $V\Delta P$

D. $\dfrac{3}{2}R$

Answer: B

126. Standard molar enthalpy of formation of CO_2 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 CO and O_2

D. the standard molar enthalpy fo combustion of carbon (graphite)

Answer: D

127. Enthalpy of a reactant is given by

A. $H = U + PV$

B. $H = U - PV$

C. $\Delta H = \Delta U + P\Delta V$

D. $\Delta H = \Delta U - P\Delta V$

Answer: A

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128. The enthalpies of the elements in their standard states are arbitrarily

assumed to be

A. zero at 298 K and 1 atm

B. unity aat 298 and 1 atm

C. zero at all temperature

D. zero at 273 K and 1 atm

Answer: A

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129. ΔH for transition of carbon in the diamond form to carbon in the graphite form , is -1897 J. This suggest that

    A. graphite is chmemically different form diamond

    B. graphite is as stables as diamond

    C. graphite is more stable than graphite

    D. diamond is more stable than graphite.

Answer: C

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130. For an ideal gas, the relation between the enthalpy and internal energy change at constant temperature is given by.

A. $H = U + PV$

B. $\Delta H = \Delta U + \Delta nRT$

C. $\Delta U = \Delta H + P\Delta V$

D. $\Delta H = \Delta G + T\Delta S$

Answer: B

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131. The enthalpy changes is negative for

A. $Cl^-(g) + aq \rightarrow Cl^-(aq)$

B. $Cl(g) \rightarrow Cl^+(g) + e^-$

C. $\dfrac{1}{2}Cl_2(g) \rightarrow Cl(g)$

D. $Cl_2(l) \rightarrow Cl_2(g)$

Answer: A

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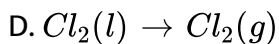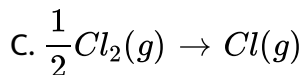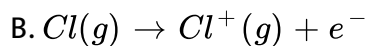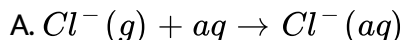
132. For which of the following substances, the standard heat enthalpy is zero.

A. C_{graphite}

B. C_{diamond}

C. CO_2

D. O_3

Answer: A

---

133. ΔH for thermal decomposition process is

A. positive

B. negative

C. zero

D. positive or negative

Answer: A

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134. Δn , the change in a chemical reaction at constant volume is given reaction.

$$C_{12}H_{22}O_{11}(s) + 12O_2(g) \rightarrow 12CO_2(g) + 11H_2O(l) \quad \text{at} \quad 25°Cis$$

A. Zero

B. -1

C. 2

D. 4

Answer: A

---

135. The Energy change. in a chemical reaction at constant volume is given by

A. ΔH

B. ΔU

C. ΔT

D. ΔV

Answer: A

---

136. Δn volue of the reaction,

$PCl_5(g) \rightarrow PCl_3(g) + Cl_2(g) is$
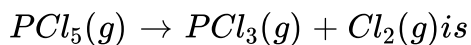
A. Zero

B. $+1$

C. -1

D. Infinite

Answer: B

137. Δn values in $\Delta H = \Delta U + \Delta nRT$ may have

A. integer nature

B. fractional value

C. positive of negative

D. all

Answer: B

138. The entalphy change for the reaction , $H_2O_s \rightarrow H_2O_{(l)}$ is called enthalpy of

 A. vapourization

 B. fusion

 C. combustion

 D. transition

Answer: D

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139. You are given the following two reactions.

$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O_{(g)} \Delta H = -890.4kj$

$2H_gO_{(s)} \rightarrow 2Hg(l) + O_2(g) - 181.6kJ$
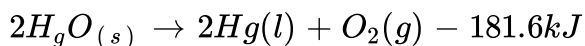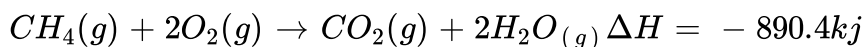
Which one of the following stat~ments is correct?

A. Both reactions are exothermic

B. Both reactions are endothermic

C. Reaction (i) is endothermic and (ii) exothermic.

D. Reaction (i) is exothermic and (ii) is endothremic

Answer: B

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140. Which of the following reaction represents enthalpy of formation of AgCl ?

A. $Ag^+_{(aq)} + Cl^-_{(aq)} \rightarrow AgCl(s)$

B. $AgCl(s) \rightarrow Ag(S) + \dfrac{1}{2}Cl_{2(g)}$

C. $Ag(s) + AuCl(s) \rightarrow AgCl(s) + Au(s)$

D. $Ag(s) + \dfrac{1}{2}Cl_{2(g)} \rightarrow AgCl(s)$

Answer: D

141. The Enthalpy of formation of $Mg(OH)_2$ and HBr are-145800 and 6400 calories, respectively .This would indicate that

A. $Mg(OH)_2$ melts at a low temperature

B. $Mg(OH)_2$ solute in acids

C. HBr is a weak acid

D. HBr is unstable

Answer: D

142. Which of the following reaction do you think will result in the absorption of heat ?

A. Carbon burning in air

B. Iron reacting with sulphur to form iron sulphide

C. Formation of water gas from steam and coke

D. Formation of producer gas.

Answer: C

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143. An exothermic reaction is one in which the reacting substances :

A. have more energy than the products

B. have less energy than the products

C. have as much energy as the products

D. have as much energy as the products

Answer: A

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144. The change in the enthalpy of $NaOH + HCl \rightarrow NaCl + H_2O$ is called :

A. Enthalpy of reaction

B. Enthalpy of neutralisation

C. Enthalpy of formation

D. Enthapy of liquefaction.

Answer: B

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145. An endothermic reaction is allowed to take place very rapidly in the air. The temperature of the surrounding air

A. increases as the pressure increases

B. decreases

C. remains same

D. cannot be predicted.

Answer: B

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146. When and exothermic reactions is reversed, it

A. becomes another exothermic reaction

B. becomes and endothermic reaction

C. shows no change at all

D. attains equilibrium

Answer: B

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147. Of the reactions stated, the endothermic reaction is

A. burring of sulphur to form sulphur to dioxide

B. conversion of monoclinic sulphur to rhombic sulphur

C. formation of carbon dioxide from carbon and oxydgen

D. melting of sulphur.

Answer: D

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148. From the reaction P(White) $\rightarrow$ P(Red) $\Delta H = -18.4 KJ$, it follows

that :-

A. Red P is readily formed from white P

B. White P is readily formed from red P

C. White P cannot be canverted into red P and red P is more stable.

D. White P can be converted into red P and red P is more stable.

Answer: D

149. Look at the following diagram.

The enthalpy change for the reaction $A \rightarrow B$ will be

A. $-25kJ$

B. $-40kJ$

C. $+25KJ$

D. $+65KJ$

Answer: A

150. Enthalpy of soultion is defined as

A. heat required to dissolved one mole solute isn excess of water

B. heat evolved, when one mole is dissolved in excess of water.

C. Change in enthalpy of the system when one mole of the solute is

disolved in excess of water, so that further dillution of solution

does not bring any heat change.

D. Enthalpy change when one mole of the solute is dissolved in limited

quantity of water.

Answer: D

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151. Enthalpy of formation of a compound is equal in magnitude to

A. Enthalpy of that reaction

B. Enthalpy of dissociation

C. Enthalpy of combustion

D. Enthalpy of solution

Answer: A

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152. For which iof the following process will energy absorbed

    A. Coversion of vapours of water into water (l)

    B. Gain of e^- by netural gaseous atom

    C. Conversion of water in to ice

    D. Conversion of ice in to water

Answer: D

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153. Which is and endothermic reaction

    A. $2H_2 + O_2 \rightarrow 2H_2O$

B. $N_2 + O_2 \rightarrow 2NO$

C. $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

D. $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$
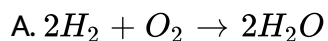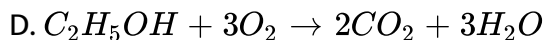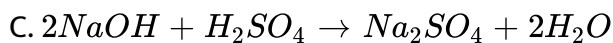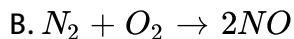
Answer: B

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154. Which of the following reaction is endothermic?

A. $CaCO_3 \rightarrow CaO + CO_2$

B. $Fe + S \rightarrow FeS$

C. $NaOH + HCl \rightarrow NaCl + H_2O$

D. $CH_4 + 2O_2 \rightarrow rCO_2 + 2H_2O$
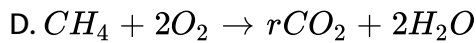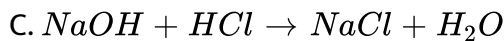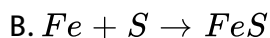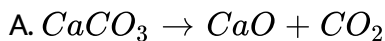
Answer: A

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155. If, $H_2(g) + Cl_2(g) \rightarrow 2HCl(g), \Delta H^\circ = -44$ Kcal

$2Na(s) + 2HCl(g) \rightarrow 2NaCl(s) + H_2(g), \Delta H = -152$ Kcal Then,

$Na(s) + 0.5Cl_2(g) \rightarrow NaCl(s), \Delta H^\circ = ?$

A. $-180kcal$

B. $-196kcal$

C. $-98kcal$

D. $54kcal.$

Answer: C

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156. Vapourisation is accompained by

A. increase in enthalpy

B. decarease in enthalpy

C. no change in internal energy

D. a or b

Answer: A

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157. Which is incorrect about the enthalpy of cambusion ?

A. The enthalpy of combustion in negative

B. Heat of combusion is always exothermic

C. Its value changes with temperature

D. It is always endothermic

Answer: D

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158. Which represents the enthalpy of formation $CO_2(g)$

A. $C_{graphite} + O_2(g) \rightarrow rCO_2(g)$

B. $CH_4(g) + 2O_2(g) \rightarrow CO_2 + 2H_2O(l)$

C. $CO(g) + 1/2O_2(g) \rightarrow CO_2(g)$

D. $C_6H_6(l)7.5O_2(g) \rightarrow 6CO_2(g) + 3H_2O(l)$
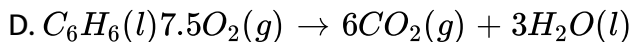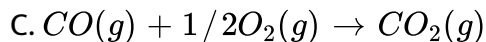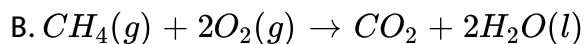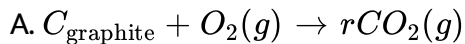
Answer: A

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159. The enthalpy combustion of a substance

A. always postive

B. always negative

C. numericaUy equal to the heat of formation

D. zero

Answer: B

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160. All reactions with chemical dissociation are

    A. reversible

    B. reversible and endothermic

    C. exothermic

    D. reversible or irreversible and endothermic or exothermic.

Answer: B

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161. The formation of water from $H_2(g)$ and $O_2(g)$ is an exothermic process because :

    A. the chemical energy of $H_2(g)$ and $0_2(g)$ is more than that of water

    B. the chemical energy of $H_2(g)$ and $O_2(g)$ is less than that of water

    C. no dependent on energy

D. the temperature of $H_2(g)$ and $O_2(g)$ is more than that of water

Answer: A

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162. ΔH for the reaction given below represents,

$$CO_2(g) + H_2(g) + CO(g) + H_2O(g), \Delta H = 40kJ$$
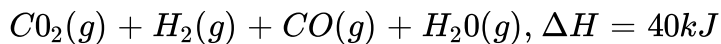
A. Enthalpy of formation

B. Enthalpy of combustion

C. Enthalpy of neutralisation

D. Enthalpy of reaction

Answer: D

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163. The heat change in a reaction does not depend upon the

A. conditions of P or V under which reaction is carried

B. initial and final enthalpies of the reactants and products

C. state of reactants and products

D. number of intermediate stages involved

Answer: D

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164. In the combustion of hydrocarbons, ΔH

A. negative

B. zero

C. positive

D. undeterminate

Answer: A

165. For an endothermic reaction, where ΔH represents the enthalpy of reaction in $kJmol^{-1}$, the minimum value for the energy of activation will be

   A. less than ΔH

   B. zero

   C. more than ΔH

   D. equal to ΔH

Answer: C

166. Which value of standard enthalpy of formation indicates that the product is the least stable

    A. -94 kcal

    B. 231.6 kcal

    C. $+ 21.4$ kcal

    D. $+64.8$ kcal

Answer: B

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167. The enthalpies of formation of organic substances are conveniently determined from

    A. Enthalpies of combustion data

    B. boiling point

    C. melting point

D. Enthalpies of neutrahsahon

Answer: A

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168. $C_{\text{graphite}} + O_2(g) \rightarrow CO_2(g), + 95.450cal.$
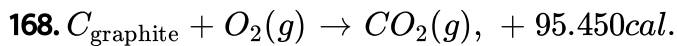
A. an exothermic reaction.

B. an endtheromic reaction.

C. a chain reaction

D. a catalytic reaction

Answer: A

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169. It is a general principle that the less energy of a system contain. it is

A. more stable

B. less stable

C. unstable

D. more unstable

Answer: A

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170. ΔH for the reaction $Cl_g + Cl_g \rightarrow Cl_{2(g)}$ will be .

A. zero

B. $= +ve$

C. $= -ve$

D. ∞

Answer: C

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171. ΔH for the reaction $H_2(H) \rightarrow H(g) + H(g)$ will be .

A. zero

B. $= +ve$

C. $= -ve$

D. ∞

Answer: C

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172. Which plot represents for an exothermic reaction ?
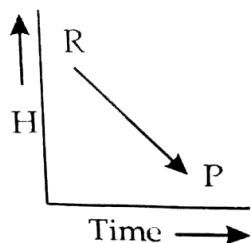
A.
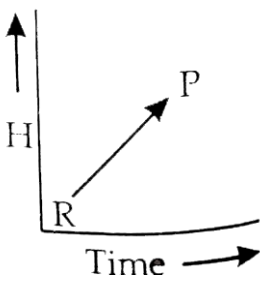
B.
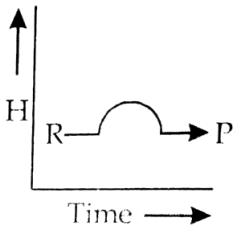
C.

D.

Answer: A

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173. Change in enthalpy is defined as

A. the change in heat content

B. the total energy change at constant pressure and temperature

C. the heat change at constant volume if $\Delta n = 0$

D. all are correct

Answer: D

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174. The word 'standard' in standard molar enthalpy change implies

    A. Temperature 298 K

    B. Pressure 1 a tm

    C. Temperature 298 K and pressure 1 atm

    D. All temperatures and all pressures

Answer: C

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175. The heat change for the reaction

$C(s) + 2S(s) \rightarrow CS_2(l)$ is called the heat of

    A. Enthalpy of solution of CS_2

    B. Enthalpy of fusion of CS_2

    C. Enthalpy of formation of CS_2

    D. Enthalpy of combustion of carbon

Answer: C

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176. The enthalpy change for the process,

$C(s) \rightarrow C(g)$ is known as enthalpy of

    A. Fusion

    B. Vaporisation

    C. Combustion

D. Sublimation

Answer: D

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177. Bond energy of a molecule :

A. is always negative

B. is always positive

C. either positive or negative

D. depends upon the physical state of the system

Answer: B

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178. Thermochemistry is the study of relationship between heat energy and

A. chemical energy

B. activation energy

C. frictional energy

D. electrical energy

Answer: A

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179. For the reaction , $3O_2 \rightarrow 2O_3, \Delta H = + ve.$ We can say that :

A. ozone is more stable than oxygen

B. ozone is less stable than oxygen and ozone decomposes forming oxygen readily

C. oxygen is less stable than ozone and oxygen readily forms ozone

D. none

Answer: B

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180. Standard enthalpy of formation of compound is defined as

    A. Heat change to form one mole of the compound from its elements

    B. Heat required to form one molecule of a compound

    C. Change in heat content of the system when one molecule of a compound is formed

    D. None

Answer: A

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181. The enthalpy changes of formation of the gaseous oxides of nitrogen

$(N_2O$ and $NO)$ are positive because of :

    A. the high bond energy of the nitrogen molecule

    B. the high electron affinity of oxygen atoms

    C. the high electron affinity of nitrogen atoms

    D. the tendency of oxygen to form 0^2 —

Answer: A

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182. A gaseous reaction was carried out, first keeping the volume constant

and next keeping the pressure constant. In the second experiment, there

was an increase in volume. The heats of reaction were different, because

    A. in the first case the energy was spent to keep the volume constant

    B. in the second case energy was spent to expand the gases

C. specific heats of compressed gases is more

D. specific heats of rarefied gases is more

Answer: B

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183. The enthalpy of formation of water is given by

A. $H_2(g) + 1/2O_2(g) \rightarrow H_2O(l), \Delta H = -68.3 kcal$

B. $2H_2(g) + O_2(g) \rightarrow 2H_2O(l), \Delta H = -136.6 kcal$

C. $H_2(g) + 1/2O_2(g) \rightarrow H_2O(l), \Delta H = -86 kcal$

D. $H_2(g)O_2(g) \rightarrow H_2O(l), \Delta H = -68.3 kcal$
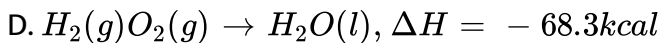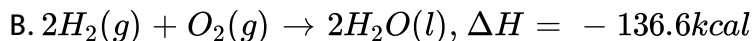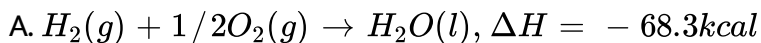
Answer: A

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184. The enthalpy of formation HI is 30.4 kJ . Which statement is false according to this observation

    A. HI is an endothermic compound

    B. For the reaction

$$H_2(g) + L_2(g) \rightarrow 2HI(g), \Delta H = 60.8kJ$$
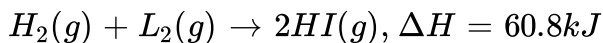
    C. HJ is a stable compound

    D. HI is an unstable compound

Answer: A::C

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185. Which is NOT characteristic of thermochemical equation

    A. it indicates physical state of reactants and products

    B. it indicates whether the reaction is exothermic or endothermic

    C. it indicates allotrope of reactants if present

D. it indicates whether reaction would occur or not

Answer: D

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186. The magnitude of heat of solution ..... On addition of solvent to solution

A. decreases

B. increases

C. remains constant

D. increases or decreases

Answer: D

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187. The enthalpy of formation of water is exothermic in nature because

A. $H_2 \& O_2$ have higher temperature than water

B. $H_2 \& O_2$ have lower temperature than water

C. $H_2 \& O_2$ have higher internal energy than water

D. None

Answer: C

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188. Two atoms of hydrogen combine to form a molecule of hydrogen gas, the energy of the H_2 molecule is :

A. greater than that of separate atoms

B. equal to that of separate atoms

C. lower than that of separate atoms

D. sometimes lower and sometimes higher

Answer: C

---

189. Standard enthalpy of one mole of graphite is

A. 1 cal mol^{-1}

B. equivalent to charcoal

C. more than diamond

D. assumed as zero

Answer: D

---

190. Which represents unit of R?

A. L atm $K^{-1} \, mol^{-1}$

B. $JK^{-1} mol - 1$

C. cal $deg^{-1}mol^{-1}$

D. all

Answer: D

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191. In a reaction, all products and reactants are liquids, hence _____ .

A. $\Delta H > \Delta U$

B. $\Delta H < \Delta U$

C. $\Delta H \Delta U$

D. None

Answer: C

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192. The law of Lavoisier and Laplace illustrates

    A. the principle of conservation of energy

    B. equivalence of mechanical and thermal energies

    C. the principle of conservation of matter

    D. equivalence of mechanical and chemical energies

Answer: A

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193. The standard enthalpy formation of $H_2O(l)$ is -68.0 kcal , the heat of formation of $H_2O(g)$ is likely to be

    A. -68.0 kcal

    B. -69.4 kcal

    C. 80.0 kcal

    D. - 58.3 kcal

Answer: D

---

194. At con s tant P and T w hich of the following statement is correct for process.

$C(s) + O_2(g) \rightarrow CO_2(g)$ ltBRgt

   A. $\Delta H > \Delta U$

   B. $\Delta H < \Delta U$

   C. $\Delta H = \Delta U$

   D. $\Delta U = O$

Answer: D

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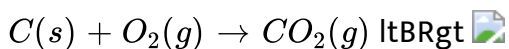
195. The equation $\Delta H = \Delta H_1 + \Delta H_2 \Delta H_3$

A. Kirchoff s equation

B. vant't Hoff isotherm

C. van 't Hoff isochore

D. Hess's law

Answer: D

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196. Calorific value of carbohydrates is approximately

A. 4.0kcal/g

B. 16.0 kcal/g

C. 20 kcal/g

D. 9.0 kcal/g

Answer: A

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197. Enthalpy of combustion of . d a reaction does not epend on

A. Physical state of the substance

B. Temperature at which combustion is carried out

C. amount of oxygen present

D. Whether the combustion is carried out in an open vessel or a

closed vessel

Answer: C

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198. The enthalpy of formation of ammonia is -46.0 kJmol^{-1}. The enthalpy

change for the reaction

$2NH_{3g} \rightarrow 2N_{2(g)} + 3H_g$ is
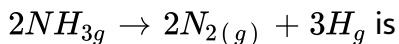
A. 46.0 kJ mol^{-1}

B. 92.0 kJ mol^{-1}

C. $-23.0 kJmol^{-1}$

D. $-92.0 kJmol^{-1}$

Answer: B

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199. The compound with positive enthalpy of formation is known as

A. endothermic

B. exothermic

C. either of these

D. none

Answer: A

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200. The decreasing order of calorific values is

A. $C_2H_2 > C_4H_{10} > C_3H_8 > C_2H_4$

B. $C_4H_{10} > C_3H_8 > C_2H_4 > C_2H_2$

C. $C_2H_4 > C_3H_4 > C_4H_{10} > C_2H_2$

D. $C_2H_2 > C_2H_4 > C_3H_8 > C_4H_{10}$
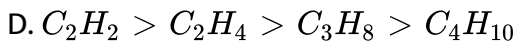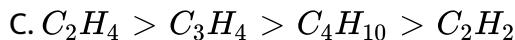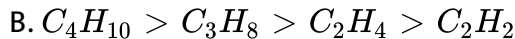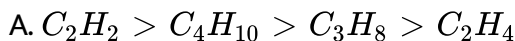
Answer: D

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201. If $\Delta H_f(X)$, $\Delta H_f(Y)$, $\Delta H_f(R)$ and $\Delta H_f(S)$ denote the enthalpies

of formation of X, Y, R and S respectively, the enthalpy of the reaction

$X + Y \to R + S$ is given by

A. $\Delta_f H(X) + \Delta_f H(Y)$

B. $\Delta_f H(R) + \Delta_f H(S)$

C. $\Delta_f H(X) + \Delta_f H(Y) - \Delta_f H(R) - \Delta_f H(S)$
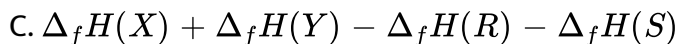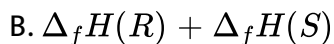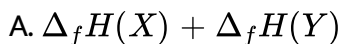
D. $\Delta_f H(S) + \Delta_f H(R) - \Delta_f H(X) - \Delta_f H(Y)$

Answer: B

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202. During isothermal expansion , real gas shows

A. $\Delta H = 0$

B. $\Delta H \neq 0$

C. both

D. none

Answer: C

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203. When water is added to quick lime, the reaction is

A. explosive

B. endothermic

C. exothemic

D. none

Answer: A

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204. A hypothetical reaction, $A \rightarrow 2B$ proceeds through following sequence of steps

$A \rightarrow C, \Delta H = a$

$C \rightarrow D, \Delta H = b$

$\frac{1}{2}D \rightarrow B : \Delta H = c$
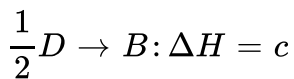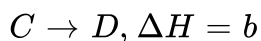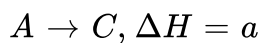
The heat of reaction is :

A. $a - b + 2c1$

B. $a + b - 2c$

C. $a + b + 2c$

D. $a + 2b + 2c$

Answer: C

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205. In a flask, colourless N_2O_4 is in equilibrium with brown-coloured NO_2. At equilibrium, when the flask is heated to $100°C$ the brown colour deepens and on cooling, the brown colour became less coloured. The change in enthalpy ΔH for the ayatem is

A. negative

B. positive

C. zero

D. undefined

Answer: B

206. Efficiency of fuel is

$$\left(\Delta G = 700.3 kJmol^{-1} \& \Delta H = 726 kJmol^{-1}\right)$$

A. $66.2\,\%$

B. $96.7\,\%$

C. $41.3\,\%$

D. $85.1\,\%$

Answer: B

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207. The bond energy of an $O - H$ bond is 109 K. cal mole^{-1}. When a mole of water is formed

A. 218 kcal is released

B. 109 kcal is released

C. 218 kcal is absorbed

D. 109 kcal is absorbed

Answer: B

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208. The enthalpy of formation (ΔH_f) of $H_O(l)$ is equal to

A. zero

B. molar enthalpy of combustion of $H_2(l)$

C. molar enthalpy of combustion of $H_2(g)$

D. sum of enthalpy of formation of $H_2O(g)$ and $O_2(g)$

Answer: A

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209. Which of the following values of enthalpy of formation indicates that the product is least stable?

A. $-94kcal$

B. $-231.6kcal$

C. $+21.4kcal$

D. $+64.8kcal$

Answer: D

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210. Which of the following equations correctly represents the standard enthalpy of formation $\left(\Delta_f H^\circ\right)$ of ethane ?

A. $2C(\text{dimond}) + 3H_{2(g)} = C_2H_{6(g)}$

B. $2C(\text{graphite}) + 3H_{2(g)} = C_2H_6(l)$

C. $2C(\text{graphite }) + 3H_{2(g)} = C_2H_{6(g)}$

D. $2C(\text{graphite}) + 6H = C_2H_{6(g)}$
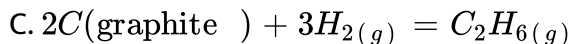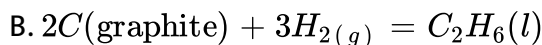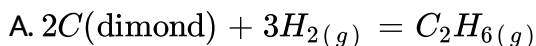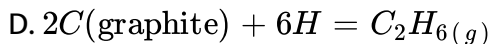
Answer: C

211. At a constant volume the epuation holds good

A. $\Delta H = \Delta U + P\Delta V$

B. $\Delta H = \Delta H = \Delta U + V\Delta P$

C. $\Delta H = \Delta U - P\Delta V$

D. $\Delta H = \Delta U - V\Delta P$

Answer: B

212. Since the enthalpy of elements in their natural state is taken to be zero, the heat of formation $(\Delta_f H)$ of compounds

    A. Is always negative

    B. Is always positive

    C. May be negative or positive

    D. Is zero

Answer: C

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213. Hess's law is related to

    A. change in heat during a reaction

    B. a reaction

    C. equilibrium constant

    D. influence of pressure on volume of a gas

Answer: A

---

214. Standard enthalpies of formation of O_3, CO_3, NH_3 and HI are 142.2,-383.2,-46.2 and +25.9kJ mol^{-1} respectively. The order of their increasing stabilities will be:

A. O_3, CO_2NH_3, HI

B. CO_2, NH_3HI, O_3

C. O_3, HI, NH_3CO_2

D. NH_3, HI, CO_2, O_3

Answer: C

---

215. The stability of an ionic compound depends principally on

A. high electron affinity of anion forming species

B. the lattice energy of crystal c

C. low ionization energy of the cation forming species

D. low heat of sublimation of cation forming solid

Answer: B

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216. Born-Haber cycle is used to determine

A. Electronegativity

B. Lattice energy

C. Both

D. None

Answer: B

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217. The approximate enthalpy of fusion of ice and the enthalpy of vaporisation of water per mole respectively are

    A. 18 kJ,80 kJ

    B. 6 kJ, 40.6 kJ

    C. 1.80 kJ, 540 kJ

    D. 8 kJ, 80 kJ.

Answer: B

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218. $S + \dfrac{3}{2}O_2 \rightarrow SO_3 + 2\text{x kcal}$

$SO_2 + \dfrac{1}{2}O_2 \rightarrow SO_3 + \text{ y kcal}$
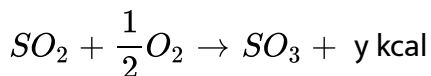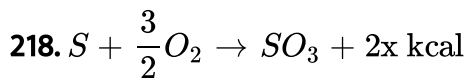
Find out the deat for formation of SO_2

    A. $(y - 2x)$

B. $(2x + y)$

C. $(x + y)$

D. $2x / y$

Answer: A

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219. The standard heats of formation of $NO_2(g)$ and $N_2O_4(g)$ are 8.0 and 2.0 Kcal mol^{-1} respectively the heat of dimerization of NO_2 in Kcal is

A. 10

B. -6.0

C. -12.0

D. -14.0

Answer: D

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**220.** The bond energy of H_2 is 436-4 kJ. This means that

A. 436.4 kJ of heat is required to b reak one bond in H_2 molecule of

give two atoms of hydrogen

B. 436.4 kJ of heat is required to dissociate 6.02×10^{23} molecules of

H_2 of form H-atoms.

C. 436. 4 kJ of heat is required to dissociate 3.01×10^{23} molecules of

H_2 to give 6.02×10^{23} atoms of hydrogen

D. 436..4 kJ of electrical energy is erquired to dissociate 6.02×210^{23}

molecules of H_2 of form H^+ and H^+ ions.

Answer: B

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221. The enthalpy changes at 298 K in successive breaking of $O - H$ bonds of water, are

$H_2O(g) \rightarrow H(g) + OH(g), \Delta H = 498 kJ mol^{-1}$

$OH(g) \rightarrow H(g) + O(g), \Delta H = 428 kJ mol^{-1}$
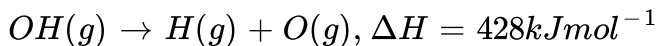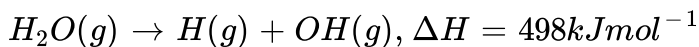
The bond energy of the O-H bond is

A. $498 \ kJ \ mol^{-1}$

B. $463 \ kJ \ mol^{-1}$

C. $428 \ kJ \ mol^{-1}$

D. $70 \ kJ \ mol^{-1}$

Answer: B

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222. In the dissociation of $CH_{4(g)}$ q

A. bond energies of all the C-H bonds are equal

B. no two bonds have same bond energy

C. two bonds have equal energy

D. three bonds have equal energy

Answer: B

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223. $H_2 + Cl_2 \rightarrow 2HCl, \Delta H = -194kJ.$

In this reaction, heat of formation of HCl in KJ is

A. $+194kJ$

B. $+97kJ$

C. $-97kJ$

D. $-194kJ.$

Answer: C

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224. Which one of the following processes is non- spontaneous ?

A. Burning of coal

B. Flow of heat from a hot.end to cold end

C. Lifting of water by an electric pump into the reservoir at the top of

the house

D. Reaction between hydrogen and oxygen to form water

Answer: C

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225. Entropy change of a system and its surroundings in equilibrium

A. increases

B. decreases

C. remains constant

D. either increases or decreases

Answer: C

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226. For the reaction $CaCO_{3(s)} \rightarrow CaO_{(S)} + CO_{2(g)}$ the entropy

A. increases

B. decreases

C. remains unchanged

D. change cannot be predicted

Answer: A

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227. A reaction has both ΔH and ΔS positive.The rate of reaction.

A. increase with increase of temperature.

B. increases with decrease of temperature

C. remains unaffected by change of temperature

D. cannot be prcdicted for change in temperature

Answer: A

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228. For and endothemic reaction of be spontaneos,

A. ΔS must be positive

B. ΔS must be negative

C. ΔG must be zero

D. ΔG must be poisitive

Answer: A

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229. $\Delta S = \Delta H / T$ holds good for

    A. adiabatic process

    B. isothermal reversible phase change

    C. a process at constant pressure

    D. a process under any conditions

Answer: B

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230. In a reversible process,

$\Delta S_{sys} + \Delta S_{surr}$ is

    A. > 0

    B. < 0

    C. maximum

D. 0

Answer: D

---

231. Which of the following expression defines the physical significance of free energy change?

A. $\Delta G = w_{\text{non exp}}$

B. $-\Delta G = w_{\text{non exp}}$

C. $\Delta G = -W_{\text{exp}}$

D. $\Delta G = W_{\text{exp}}$

Answer: B

232. Which one of the following is correct?

A. $-\Delta G = \Delta H - T\Delta S$

B. $\Delta H = \Delta G - T\Delta S$

C. $\Delta S = \dfrac{1}{T}[\Delta G - \Delta H]$

D. $\Delta S = \dfrac{1}{T}[\Delta H - \Delta G]$

Answer: D

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233. Which of the following describes the criterion of spontaneity?

A. $\Delta H_T, P > 0$

B. $\Delta S_{total} > 0$

C. $\Delta G_T, P > 0$

D. All of these

Answer: B

---

234. For the percipitation reaction of $Ag^{\oplus}$ ions with $NaCI$, which of the following statements is true?

A. ΔH for the reacti on is zero

B. ΔG for the reaction is zero

C. ΔG for the reaction is zero

D. $\Delta G = \Delta H$

Answer: C

---

235. Which of the following relationship is correct ?

A. $\Delta G^\circ = -RT \ln K$

B. $K = e^{-}\Delta G^\circ / RT$

C. All a re correct

D. all are correct

Answer: D

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236. For a reaction $R_1, \Delta G = xkJ/mol.$ For a reaction $R_2, \Delta G = yKJ/mol.$ Reaction R_1, is non-spontaneous but along with R_2 it is spontaneous. This means that

A. x is - ve, y is +ve but in magnitude x gt y'

B. x is + ve, y is - vc but in magnitude y gt x

C. both x and y are - ve but not equril

D. both x and y are +ve but not equal

Answer: B

237. A spontaneous change is one in which a system under goes

    A. An increase in internal energy

    B. A lowering of entropy

    C. lowering of free energy

    D. No energy change

Answer: C

238. A catalyst

    A. increases the froe energy change of the reaction

B. decreases the free energy change of the reaction

C. docs not increase or decrease the free energy change of the reaction

D. can either increase or decrease the free energy change depending upon what catalyst we use

Answer: C

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239. For which one of the following reactions will there be a more - ve ΔS ?

A. $H_2O_g \rightarrow H_2O_l$

B. $H_{2(g)} + I_{2(g)} \rightarrow 2HI_{(g)}$

C. $CaCO_{3(g)} \rightarrow CaO_{(s)} + CO_{2(g)}$

D. $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$

Answer: D

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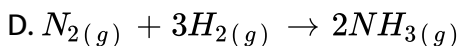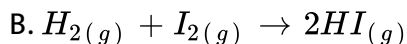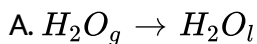
240. ΔG for the reaction $Ag_2O \rightarrow 2Ag + 1/2O_2$, at a certain temperature is found to b-e - 10.0 kJmol^{-1} Which one of the fol low ing statemEcgtnts is correct at this temperature ? '

A. Silver oxide d ecom poses to give silver and oxygen

B. Silver and oxygen combine to fonn silver oxide

C. The reaction is in equilibrium

D. The reacti on can neither occur in the fo n Yard direction nor in the

backward d irection

Answer: A

241. In which of the following change entropy decreases?

A. Crystallisation of sucrose from solution

B. Rusting of iron

C. Melting of ice

D. Vapori zation of camphor

Answer: A

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242. For the process $CO_{2(s)} \rightarrow CO_{2(g)}$

A. both ΔH and ΔS are positive

B. ΔH is negative and ΔS is positive .

C. ΔH is positive and ΔS is negative

D. Both ΔH and ΔS are negative.

Answer: A

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243. Enthalpy of a reaction at $27°C$ is 15 kJ mol^{-1}The reaction will be feasible if entropy is

A. 15 J $mol^{-1}K^{-1}$

B. $-50J$ mol $^{-1}K^{-1}$

C. greater than 50 J $mol^{-1}K^{-1}$

D. less than 50 J $mol^{-1}K^{-1}$

Answer: C

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244. A system changes its state form A to B . The resulting change of entropy will be a definite quantity

A. When the change is a reversible one

B. When the change is an irreversible one

C. when the change is an isothermal one

D. always , irrespective of the manner of the manner In which the

change is brought about,

Answer: D

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245. A particular reaction has a negative value for the free energy change.

Then at ordinary temperature

A. it has a large -ve value for the entrop ch Y ange

B. it has a large +ve value for enthalpy change

C. it has a small +ve value for enthalpy change

D. it has a +ve value for the entropy change and a -ve value for the enthalpy change

Answer: D

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246. Which of the following is true for $\Delta H \ H_2O_l \Leftrightarrow H_2O_g 100°C$

A. $\Delta S = 0$

B. $\Delta H = 0$

C. $\Delta H = \Delta U$

D. $\Delta H = T\Delta S$

Answer: D

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247. A boiled egg show a/an...... in entropy.

A. increases

B. decreases

C. no change

D. none of these

Answer: A

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248. Entropy change of vapourisation at constant pressure is given by :

A. $\Delta S_{(v)} = \dfrac{\Delta H_v}{T}$

B. $\Delta S_{(v)} = \dfrac{\Delta U_v}{T}$

C. $\Delta S_{(v)} = -\dfrac{\Delta H_v}{T}$

D. none of these

Answer: A

---

249. ΔS is positive for the change :

A. mixing of two gases

B. boiling of liquid

C. melting of solid

D. all of these

Answer: D

---

250. Entropy change of fusion at constant pressure is , given by L

A. $\Delta S_{(f)} = \dfrac{\Delta H_f}{T}$

B. $\Delta S_{(f)} = \dfrac{\Delta G_f}{T}$

C. $\Delta S_{(f)} = -\dfrac{\Delta H_f}{T}$

D. none of these

Answer: A

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251. Which has the least entropy :

A. Graphite

B. Diamond

C. $N_{2(g)}$

D. $N_2O(g)$

Answer: B

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252. The unit of entropy is

A. $JK^{-1}mol^{-1}$

B. $KJ^{-1}mol^{-1}$

C. $KJmol^{-1}$

D. $J^{-1}K^{-1}mol^{-1}$

Answer: A

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253. Identify the correct statement regarding entropy :

A. At absolute zero of temperature, the entropy of perfectly crystalline

substance is + ve.

B. At absolute zero of temperature entropy of perfectly crystalline

substance is zero.

C. At 0°C the entropy of a perfectly crystalline substance is taken to be zero.

D. At absolute zero of temperature, the entropy of all crystalline substance is taken to be zero.

Answer: B

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254. Equilibrium constant of a reaction is related to :

A. standard Gibbs energy change, ΔG°

B. Gibbs energy change, ΔG

C. neat enthalpy

D. none of these

Answer: A

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255. For a system in equilibrium, $\Delta G = 0$, under conditions of constant

A. temperah1re and pressure

B. temperature and volume

C. energy and volume

D. pressure and volume.

Answer: A

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256. The total entropy change for a system and its surroundings increases, if the process is

A. reversible

B. irreversible

C. exothermic

D. endothermic

Answer: B

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257. The combustion reaction occuring in an automobile is

$2C_8H_{18} + 25O_2(g) \rightarrow 16CO_2(g) + 18H_2O(g)$ This reaction is accompanied with:

A. +, -, +

B. -, +, -

C. -,+,+

D. +,+,-

Answer: B

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258. When one mole of an ideal gas is compressed to half of its initial volume then ΔS is

A. Zero

B. Positive

C. Maximum

D. Negative

Answer: D

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259. The standard Gibb's free energy change, ΔG° is related to equilibrium constant, kp as

A. $K_p = -RTIn\Delta G^\circ$

B. $K_p = \left[\dfrac{e}{RT}\right]^{\Delta G^\circ}$

C. $K_p = -\dfrac{\Delta G}{RT}$

D. $K_p = e^{-\Delta G^o / RT}$

Answer: D

---

260. For which of the following processes is ΔS negative?

A. $H_{2g} \rightarrow 2H_{(g)}$

B. $N_{2(g,1atm)} \rightarrow N_{2(g,8atm)}$

C. $2SO_{3(g)} \rightarrow 2SO_{2(g)} + O_{2(g)}$

D. $C_{(diamond)} \rightarrow C_{(graphite)}$

Answer: B

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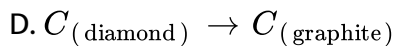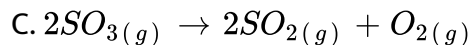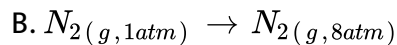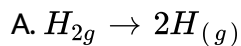
261. Which law of thermodynamics introduces the concept of entropy ?

A. First law

B. Zeroth law

C. Third law

D. Second law.

Answer: D

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262. In any natural process

A. The entropy of universe remains constant

B. The entropy of universe tends towards maximum

C. The entropy of universe tends towards minimum

D. Any of the above can happen

Answer: B

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263. Which one is incorrect statement of the second Jaw of thermodynamics

A. It is impossible for a cyclic process to transfer heat from a system at a lower temperature to one at a higher temperahire without convertin some work to heat

B. It is impossible to convert heat completely into equivalent amount of work with producing changes elsewhere

C. Every perfect machine working reversibly between the same temperatures of source an smk have the same efficiency whatever be the nature of the substance used

D. Heat engines can be made l00o% sufficient.

Answer: D

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264. Identify the correct statement regarding entropy

A. At absolute zero of temperature, entropy of a perfectly crystalline substance is taken to be zero

B. At absolute zero of temperature, the entropy of a perfectly crystalline substance is positive

C. Absolute entropy of a substance cannot be determined

D. At 0°C, the entropy of a perfectly crystalline substance is taken to be zero.

Answer: A

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265. The heat required to decompose a compound into its elements is equal to the heat evolved when the compound is formed from its elements. This is in accordance with

A. Hess's law

B. First law of thermodynamics

C. Joule-Thomson law

D. Kirchoff s law.

Answer: B

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266. A monoatomic helium molecule possesses

A. only potential energy

B. potential as well as vibrational energy

C. vibrational as well as translational energy

D. translational as well as potential energy.

Answer: D

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267. Pumping of air in rubber tube is an

    A. adiabatic expansion

    B. adiabatic compression

    C. isothermal expansion

    D. isothermal compression

Answer: B

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268. Maximum entropy will be in which of the following?

    A. Ice

    B. Liquid water

    C. Snow

D. Water vapour

Answer: D

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269. It a gas has 2 atm and 5 atm pressure at 30° c and 27ºC respectively

Then it will

    A. cool on expansion

    B. warm on expansion

    C. no change on expansion

    D. None of the above

Answer: B

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270. For an isolated system, $\Delta U = 0$, what will be ΔS?

A. 0

B. > 0

C. < 0

D. ≥ 0

Answer: B

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271. For amorphous substance at 273K entropy is

A. is always positive

B. is always negative

C. is always zero

D. other than zero

Answer: D

---

272. The standard molar entropy of H_2O_l is $70JK^{-1}moJ^{-1}$ Standard molar entropy of $H_2O(s)$ is

A. more than $70JK^{-1}mol^{-1}$

B. less than $70JK^{-1}mol^{-1}$

C. equal to $70JK^{-1}mol^{-1}$

D. None of the above

Answer: B

---

273. Which of the following has $\Delta S°$ greater than zero

A. $CaO(s) + CO_2(g) \rightarrow CaCO_3(s)$

B. $NaCl(aq) \rightarrow NaCl(s)$

C. $NaNO_3(s) \rightarrow Na(aq) + NO_3^-(aq)$

D. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
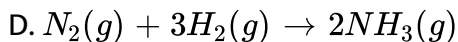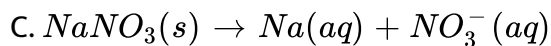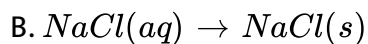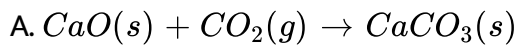
Answer: C

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274. A gas is allowed to expand reversibly under adiabatic conditions. What is zero for such a process ?

A. ΔG

B. ΔT

C. ΔS

D. none of these.

Answer: C

275. Mark the correct statement

A. For a chemical reaction to be feasible, ΔG should be zero.

B. Entropy is measure of order in a system.

C. For a chemical reaction to be feasible, ΔG should be positive.

D. The total energy of an isolated system is constant

Answer: D

276. All the natural processes tend to occur in a direction that will lead to equilibrium. This is a statement of

A. Third law of themodynamics

B. Zeroth law of thermodynamics

C. First law of thermodynamics

D. Second law of thermodynamics.

Answer: D

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277. 5 litre-atmosphere is approximately equal to

A. 5.05 j

B. 506.5 J

C. 41.55 J

D. 4155 J

Answer: B

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278. The maximum work done in expanding 1.6×10^{-2} oxygen at 300 k

and occupying a volume of $10 cm^3$ isothermally until the volume of $10 dm^3$

isothermally   unti   the   volume   becomes

$50 dm^2 is \left(R = 8.314 JK6^{-1} mol^{-1} \right)$

A. $-2.0 \times 10^3 J$

B. $-2.81 \times 10^3 J$

C. $2.0 \times 10^{-3} J$

D. $-2.0 \times 10^{-6} J$

Answer: A

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279. The work done in joules when two moles of an ideal gas are

compressed at 300 K from 1 dm^3 to $100 cm^3$ against a constant pressure

of $3.2 \times 10^5 Nm^2$ is

A. $+14.4 \times 10^2 J$

B. $+2.88 \times 10^2 J$

C. $+28.8 \times 10^2 J$

D. $+28.8 \times 10^2 J$

Answer: B

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280. A system absorbs 920 J of heat and does work. The change in internal energy (ΔU) for the process is 460 J. The work done by the system is

A. 250 J

B. $-250J$

C. $-460J$

D. $+460J$

Answer: C

281. The work done when 5 moles of an ideal gas expands isothermally

from $45m^3$ to $55m^3$ against a constant pressure of 100 pascal in J/mol

is

A. -500

B. -1000

C. -5000

D. -200

Answer: D

282. The work done in ergs for a reversible expansion of n mole of an

ideal gas from a volume of 20 litres to 40 litres at $25°$ C is a

A. $-2.303 \times 8.314 \times 298 \times \log_{10} 2 \times n$

B. $-2.303 \times 0.0821 \times 298 \log_{10} 2 \times n$

C. $-2.303 \times 0.0821 \times 298 \log_{10} 0.5 \times n$

D. $-2.303 \times 8.314 \times 10^7 \times 298 \log_{10} 2 \times n$

Answer: D

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283. One mole of an ideal gas expands isothermally at 300 K from 1 litre to 101 litres at constant pressure of 1 atmosphere. The work done during this change is (1 lit atrn = 24.2 cals)

A. $-242 kcals$

B. $-24.2 kcals$

C. $-2 kcals$

D. $-2.42 kcals$

Answer: D

---

284. The maximum work obtained by an isothermal reversible expansion of 1 mol of an ideal gas at $27°C$ from 2.24 to 22.4 L is (R=2 cal)

    A. $-1381.8 ncal$

    B. $-600 ncal$

    C. $-690.9 ncal$

    D. $-6000 ncal$

Answer: A

---

285. Two moles of an ideal gas expand spontaneouly into vacuum. The work done is :-

A. zero

B. 2 J

C. 4 J

D. 8 j

Answer: A

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286. 10 kg of four different gases (Cl_2, CH_4, O_2, N_2) expand isothermally and reversibly from 20 atm to 10 atm. The order of amount of work will be

A. $Cl_2 > CH_4 > O_2 > N_2$

B. $CH_4 < N_2 < O_2 < Cl_2$

C. $O_2 > N_2 > CH_4 > Cl_2$

D. $CH_4 > N_2 > O_2Cl_2$

Answer: D

---

287. The consstant external pressure required to compress 1 mole of an ideal gas form $23 \times 10^{-3} m^3$ to $8 \times 10^{-3} m^3$ when work obtained is 9.09 k J at $27° C$ is

A. $6.06 \times 10^5 Nm^2$

B. $6.60 \times 10^5 Nm^2$

C. $0.606 \times 10^7 Nm^{-2}$

D. $6.06 \times 10^4 Nm^{-2}$

Answer: A

288. The work done when 1.6×10^{-2} kg of oxygen at 300 K are expended isothermally and reversibly , till its volume is tripled is $\left(R = 8.314 JK^{-1}mol^{-1}\right)$

A. $-0.646KJ$

B. $-1.370kJ$

C. $-864.5kJ$

D. $-645.4kJ$

Answer: B

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289. The work done in ergs for the reversible expansion of one mole of an ideal gas from a volume of 10 litres to 20 litres at $25° C$ is

A. $-2.303 \times 298 \times 0.082 \log 2$

B. $-298 \times 10^5 \times 831 \times 2.303 \log 2$

C. $2.303 \times 298 \times 0.082 \log 0.5$

D. $2.303 \times 298 \times 2 \log 2$

Answer: B

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290. If 2500 cal. of heat is added to a system while the system does work equivalent to 3500 cal by expanding against the surrounding atmosphere, the value of ΔU for the system is

A. 4000 cal

B. $-4000 cal$

C. 1000 cal

D. $-1000 cal$

Answer: D

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291. 2 moles of H_2 at 5 atm expands isothermally and reversibly at $57°C$ to 1 atm. Work done is

A. $-2.302 \times 8.314 \times 330 \times \log 5 J$

B. $-2.303 \times 8.314 \times 660 \times \log 5 J$

C. $-2.303 \times 8.314 \times 660 \times \dfrac{\log 1}{5} J$

D. $-2.303 \times 8.314 \times 330 \times \dfrac{\log 1}{5} J$

Answer: B

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292. An ideal gas expands from $10^{-3}m^3$ to $10^{-2}m^3$ at 300 K against a constant pressure of $10^5 Nm^{-2}$. The workdone is

A. $-10^3 kJ$

B. $10^2 kJ$

C. $-0.9kJ$

D. $-900kJ$

Answer: C

293. Two liters of N_2 at $0°C$ and 5 atm pressure is expanded isothermally against a constant external pressure of 1 atm untill the pressure of gas reaches 1 atm. Assuming gas to be ideal, claculate the work of expansion.

A. $-202.6J$

B. $-202.6J$

C. $-810.4J$

D. $-303.9J$

Answer: D

294. A gas present in a cylinder fitted with a frictionless pistion expands against a constant pressure of $1atm$ form a volume of $2L$ to a volume of $6L$. In doing so, it absorbs $800J$ heat form the surroundings. Determine the increases in internal enegry of process.

A. 698.7 J

B. 1205.2J

C. 394.8 J

D. 597.4 J

Answer: C

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295. Work done in expansion of an ideal gas from 6 litre to 10 litre against a constant external pressure of 2.5 atm was

A. $-1013kJ$

B. $-1013J$

C. $+1013kJ$

D. $+1013J$

Answer: B

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296. Work done on 3 moles of a perfect gas at $27°$ C, if it is compressed reversibly and isothermally from a pressure of $1.01 \times 10^5 Nm^{-2}$ to $5.05 \times 10^6 Nm^{-2}is$

A. $1.95 \times 10^4 J$

B. -1.95×10^4 J

C. $2.9277 \times 10^4 J$

D. $-9375 \times 10^3 J$

Answer: C

297. The work done during expansion is used to heat 10 mole of water of temperature of 290 K.

A. $24.11J$

B. $11.24kJ$

C. $-24.\,11kJ$

D. $-11.24kJ$

Answer: C

298. 1 mole of gas occupying 3 litre volume is expanded against a constant external pressure of 5 atm to a volume of 15 litre. The work done by the system is

A. -1.2 litre atm n

B. $-6.07 \times 10^2 J$

C. $-1.215 \times 10^3 J$

D. $-6.078 \times 10^3 J$

Answer: D

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299. Calculate the work done when 1.0 mol of water at $373K$ vaporises against an atmosheric pressure of $1.0atm.$ Assume ideal gas behaviour.

A. $-6200J$

B. $-306J$

C. $-3100J$

D. $-1550J$

Answer: C

300. A gas absorbs $250J$ of heat and expands from 1 litre to 10 litres against the pressure 0.5 atmosphere at constant temperature. The values of q, w and ΔE are respectively

A. 250 J,455 J, 710 J

B. 250 J, -455 J, -205 J

C. $+250J$, -455, $-205J$

D. $-250J$, $455J$, $-205J$

Answer: B

301. The work done in an open vessel at 300 K, when 224 g iron reacts with dil. HCl is (Fe = 56)

A. 1.2 k cal

B. 2.4 k cal

C. 2.4 cal

D. 1.2 cal

Answer: B

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302. 3 moles of an ideal gas is compressed from $30dm^3$ to $20dm^3$ against a constant pressure of $3.039 \times 10^5 Nm^{-2}$.The work done in calories is $(1J = 0.239cal)$

A. $+30.39kcal$

B. $+72.63kcal$

C. $+726.3kcal$

D. $+303.\,9kcal$

Answer: C

---

303. Isothermally and reversibly one mole of neon expand from $2cm^3$ to $20m^3$ and produce 831.4 J of work. The temperature at which expansion takes place $(R = 8.314JK^{-1}mol^{-1})$

A. 43.42 K

B. 300 K

C. 100 K

D. 434 .2 K

Answer: A

304. 2 moles of an ideal gas expanded isothermally from $2.5 \times 10^{-3}m^3$ to $7.55 \times 10^{-3}m^3$ against a constant external pressure of $5 \times 10^5 Nm^{-2}$ The work done in the process is

A. $-2.525kJ$

B. $-0.2525kJ$

C. $-0.2525kJ$

D. $-2.525J$

Answer: A

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305. A system is provided 50 J of heat and work can be done on the system is 10 J. The change in internal energy during the process is:

A. 40 J

B. 60 J

C. 80 J

D. 50 J

Answer: B

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306. The work done by 100 calorie of heat in isothermal expansion of ideal gas is :-

A. $-418.4J$

B. $4.184J$

C. $+418.4J$

D. $-4.184J$

Answer: C

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307. The work done by a system is 8 J, when 40 J heat is supplied to it. The change in internal of the system during the process

A. 48 J

B. 40 J

C. 32 J

D. 44 J

Answer: C

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308. Calculate the work done during the process, when one mole of gas is allowed to expand freely into vacuum.

A. Zero

B. $+ve$

C. $-ve$

D. Either of these

Answer: A

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309. Calculate the maximum work done in expanding $16g$ of oxygen at $300K$ occupying volume of $5dm^3$ and isothermally untill the volume become $25dm^3$?

A. $-2.01 \times 10^3 J$

B. $+2.81 \times 10^3 J$

C. $2.01 \times 10^{-3} J$

D. $+2.01 \times 10^{-6} J$

Answer: A

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310. 1 mole of gas occupying 3 litre volume is expanded against a constant external pressure of 1 atm to a volume of 15 litre. The work done by the system is:

A. $-1.216 \times 10^3 \, J$

B. $-12.16 \times 10^3 \, J$

C. $-121.6 \times 10^3 \, J$

D. $-12.16 \times 10^3 \, J$

Answer: A

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311. One mole of a gas occupying $3 dm^3$ expands against a constant external pressure of 1 atm to a volume of 13 lit. The workdone is :-

A. $-10 \; atm \; dm^3$

B. $-20 \; atm \; dm^3$

C. $-39 \ \text{atm dm}^3$

D. -48atm dm^3

Answer: A

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312. If 50 calories are added to a system and system does work of 30 calories on surroundings, the change in internal energy of system is

A. 20 cal

B. 50 cal

C. 40 cal

D. 30 cal

Answer: A

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313. $\Delta U = +200J$ for a system that gives off 200 J of heat and

    A. does 200 J of work

    B. has 400 J of work done on it

    C. does no work

    D. has 100 J of work done on it

Answer: B

314. A system absorbs 10 kJ of heat and does 4 kJ of work the internal energy

    A. decrease by 6 kJ

    B. increase by 6 kJ

    C. decrease by 14 kJ

    D. increase by 14 kJ.

Answer: B

---

315. A gas sample is compressed to pressure of 5 atomispheres in order to show a decrease in volume from 6 litre to 4 litres .The process gives out 6 cal. Of heat to surroundings.The system during the operatoin is

A. -24.8

B. 248

C. -248

D. 24.8

Answer: B

316. A gas expands isothermally from 1 litre to 10 litre at constant in internal energy of the system durin the opetation is

A. $256J$

B. $456J$

C. $-184J$

D. $-256J$

Answer: B

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317. In a process a system does 238 J of work on its surrondings by absorbing 54 J heat. What is the change is internal energy of system during the operation ?

A. 54 J

B. 222 J

C. $-184J$

D. $-192J$

Answer: C

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318. A gas placed in a cylinder fitted with a frictionless piston expands against a constant external pressure of 1 atm from a volume of 10 litre to 15 litre by absorbing 400 J heat. The change in internal energy is

A. $-106.325J$

B. $106.325J$

C. $-906.325J$

D. $-192J$

Answer: A

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319. A gas occupies 3 litres at STP. It is provided with 300 J heat so that its volume becomes 3.5 litre at 2 atm. Calculate change in its internal energy

A. 249.35 J

B. 46.75 J

C. 198.7 J

D. $-350.65J$

Answer: C

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320. Calculate the work done when 1.0 mol of water at $373K$ vaporises against an atmosheric pressure of $1.0atm.$ Assume ideal gas behaviour.

A. $-6200J$

B. $-306J$

C. $-3100 J$

D. $-1550 J$

Answer: C

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321. 28g of N_2gas at 300 K and 20 atm was allowed to expand isothermally against a constant external pressure of 1 atm , q for the gas is $(R = 0.082)$.

A. 2495 J

B. 7473 J

C. 2367 J

D. 2570 J

Answer: C

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322. Latent heat of vaporisation of a liquid at $500K$ and 1 atm pressure is $10.0 kcal / mol$. What will be the change in internal energy (ΔE) of 3 mol of liquid at same temperature?

    A. 13.0 kcal

    B. -13.0 kcal

    C. 27.0 kcal

    D. -27.0 kcal

Answer: C

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323. The latent heat of vapurization of liquid at 500 K and 1 atm pressure is 10 k cal/ mol. The change in internal energy of 2 moles of liquid at same temperature will be (assume that molecule undergoes no changes and R = 2 cal /K/ mol)

A. -7 kcal

B. $+7$ kcal

C. -8 kcal

D. 18 kcal

Answer: D

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324. The Enthalpy of combusion off carbon is $-94kcal$ at 1 atm pressure, the itrinsic energy of CO_2 is

A. $+94$ kcal

B. -94 kcal

C. $+47$ kcal

D. -47 kcal

Answer: B

325. The difference between between ΔH and ΔU for the formation of $C_6H_{12}O_6(S)$ from its elements at $27°C$ is __ cal. (R=2 cal /K/mol)

A. $- 5400$

B. $- 9000$

C. $- 4800$

D. $- 6400$

Answer: A

326. The difference between the heats of reaction at constant pressure and a constant volume for the reaction $2C_6H_6(l) + 15O_2(g) \rightarrow 12CO_2(g) + 6H_2O(l)$ at $25°C$ in kJ is

A. -7.43

B. $+3.72$

C. -3.72

D. $+7.43$

Answer: A

327. The enthalpy of formation of methane $C_{(S)} + 2H_{2(g)} \rightarrow CH_4(g)$ at constant pressure is 18500 cal at $25°C$. The enthalpy of reaction at constant volume would be

A. 19096 cal

B. 18789 cal

C. 18202 cal

D. 17904 cal

Answer: A

---

328. For the homogeneous gaseous phase reaction, $C_2H_{6(g)} + \dfrac{15}{2}O_{2(g)} \rightarrow 6CO_{2(g)} + 3H_2O(g)$, the change in the number of moles of gaseous products is
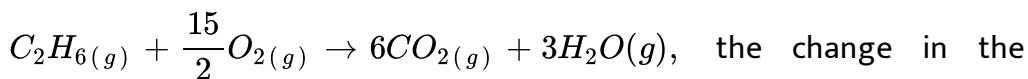
A. 1.5

B. -1.5

C. 0.5

D. 3

Answer: C

329. For a gaseous reaction, $A(g) + 3B(g) \rightarrow 3C(g) + 3D(g)$, ΔU is 17 kcal at $27°C$. Assuming $R = 2cal \quad K^{-1}mol^{-1}$, the value of ΔH for the above reaction is:

A. 15.8 kcal

B. 16.4 kcal

C. 18.2 kcal

D. 20.0 kcal

Answer: C

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330. Given the reaction at $967°C$ and $1atm$.

$CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g)$
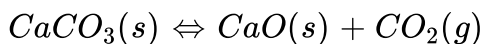
$\Delta H = 176kJmol^{-1}$, then ΔE equals

A. 160.0 kJ

B. 165.6 kJ

C. 186.4kJ

D. 180.0 kJ.

Answer: B

---

331. The heat of combustion of ethanol determinal in a bomb calorimeter is -670.48 K. Cals mole^{-1} at $25° C$. What is ΔH at $25° C$ for the reaction :-

A. $- 335.24$ kcal

B. 669.58 kcal

C. $- 670.48$ kcal

D. $+ 670.48$ kcal

Answer: B

332. The difference in ΔH and ΔU for the combustion of methane forming water in liquid state at 25ºC would be

A. Zero

B. $2x\,298x(\,-\,2)cal$

C. $2x\,298x(\,-\,3)cal$

D. $2x\,25x(\,-\,3)cal$

Answer: B

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333. For a reaction $2X(s) + 2Y(s) \rightarrow 2C(l) + D(g)$ the ΔH 25^oC is $-25Kcalmol^{-1}$. The ΔU is .... Kcal mol^{-1}.

A. -27.4

B. $+27.4$

C. -28.6

D. 28.4

Answer: C

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334. Δn the change in the number of moles for the reaction,

$$C_{12}H_{22}O_{11}(s) + 12O_2(g) \rightarrow 12O_{2(g)} + 11H_2O(l) \text{ at } 25^oC$$
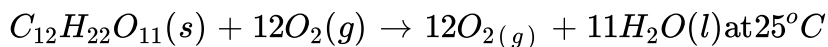
A. Zero

B. -1

C. 2

D. 4

Answer: A

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335. Latent heat of vaporisation of a liquid at $500K$ and 1 atm pressure is $10.0 kcal/mol$. What will be the change in internal energy (ΔE) of 3 mol of liquid at same temperature?

A. 27.0 kcal

B. 13.0 kcal

C. -27.0 kcal

D. -13.0 kcal

Answer: A

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336. The heat of combustion of solid benzoic acid at constant volume is $-321.30kJ$ at $27°C$. The heat of combustion at constant pressure is

A. $-321.30 - 300R$

B. $-321.30 + 300R$

C. $-321.30 - 150R$

D. $-321.30 + 900R$

Answer: C

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337. Equal volume of C_2H_2 and H_2 are combusted under identical condition , The ratio of their enthalpy of comabution is

$H_{2(g)} + (1/2)O_{2(g)} = H_2O(g) , \Delta H = -241.8KJ$

$C_2H_{2(g)} + (5/2)O_2(g) = 2CO_{2(g)} + H_2O(g)\Delta H = -1300KJ$
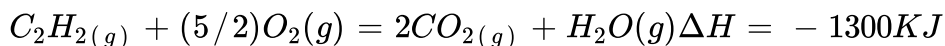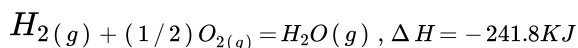
A. 5.37/1

B. 1/5.37

C. $\dfrac{1}{1}$

D. None of these

Answer: B

▶

338. When 0.2g of butanol was burnt in a suitable apparatus, the heat evolved was sufficient to raise the temperature of 200g of water by 5° C The enthalpy of combustion of butanol in Kcal/mol will be (molar mass of butanol = 74)

A. 14.8

B. 74

C. 37

D. 370

Answer: D

339. The heat of combustion of sucrose $(C_{12}H_{22}O_{11})$ is $1350 kcal/mol$. How much of heat will be liberated when $17.1 g$ of sucrose is burnt ?

A. 67.5 kcal

B. 13.5 kcal

C. 40.5 kcal

D. 25.5 kcal

Answer: A

340. If $C_6H_{12}O_6(s) + 9O_2(g) \rightarrow 6CO_2(g) + 6H_2O(g), \Delta H = -680$

Kcal The weight of $CO_2(g)$ produced when 170 Kcal of heat is evolved in

the combustion of glucose is :-

A. 264 g

B. 66 g

C. 11 g

D. 44 g

Answer: B

341. When 12.0 g of carbon reacted with limited quantity of oxygen, 57.5 kcal of heat was produced, calculate the number of moles of CO produced $(\Delta_f H(CO_2)) = -94.5cal, \Delta_f H(CO) = -21.41kcal.$

A. 0.54 mol

B. 0.50 mol

C. 0.64 mol

D. 0.74 mol

Answer: B

342. According to equation,

$$C_6H_6(l) + 15/2O_2(g) \rightarrow 6CO_2(g) + 3H_2O(l), \Delta H = -3264.4 \text{KJ mol}^{-1}$$
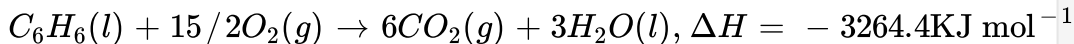
the energy evolved when 7.8 g benzene is burnt in air will be -

A. $-326.4 kJ/mol$

B. 326.4 kJ//mol

C. 32.64 kJ //mol

D. 3.264 kJ//mol

Answer: B

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343. Given

$$C + 2S \rightarrow CS_2, \Delta Hf^\circ = +117.0 kJmol^{-1}$$

$$C + O_2 \rightarrow CO_2, \Delta Hf^\circ = -393.0 kJmol^{-1}$$

$$S + O_2 \rightarrow SO_2, \Delta Hf^\circ = -297.0 kJmol^{-1}$$

The heat of combustion of

$CS_2 + 3O_2 \rightarrow CO_2 + 2SO_2$ is
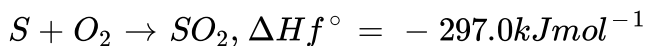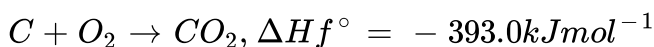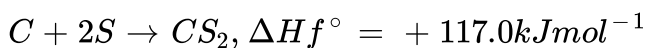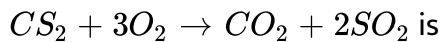
A. $-807 \ \text{kJ mol}^{-1}$

B. $-1104 \ \text{kJ mol}^{-1}$

C. $+1104 \ \text{kJ mol}^{-1}$

D. $+807 \ \text{kJ mol} - 1$

Answer: B

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344. One mole of methanol, when burnt in oxygen, gives out 723 kJ mol^{-1} heat. If one mole of oxygen is used, what will be the amount of heat evolved ?

A. 723kJ

B. 964kJ

C. 482kJ

D. 241kJ.

Answer: C

345. The heat of combustion of methane is $-880 KJmol^{-1}$. The quantity of heat liberated in the combustion of 3.2 g methane is

    A. 176 kJ of heat is evolved

    B. - 176 kJ of heat is evolved

    C. 88 kJ of heat is evolved

    D. - 88 kJ of heat is evolved

Answer: A

346. The enthalpy of formation for $C_2H_4(g)$, $CO_2(g)$ and $H_2O(l)$ at $25°C$ and 1 atm. Pressure be 52, -394 and $-286kJmol^{-1}$ respectively. The enthalpy of combustion of $C_2H_4(g)$ will be

A. $+1412kJmol^{-1}$

B. $-1412kJmol^{-1}$

C. $+141.2kJmol^{-1}$

D. $-141.2kJmol^{-1}$

Answer: B

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347. If, combustion of $4g$ of CH_4 liberates $2.5kcal$ of heat, the heat of combustion of CH_4 is :

A. -20 kcal

B. -10.3 kcal

C. 2.5　kcal

D. −5　kcal

Answer: B

348. On combustion carbon forms two oxides CO and CO_2, heat of formation of CO_2 is $-94.3 kcal$ and that of CO is -26. kcal. Heat of combustion of carbon is:

A. 26.0　kcal

B. −94.3　kcal

C. 68.3　kcal

D. −120. 3　kcal

Answer: B

349. For the reaction

$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l), \Delta E = -1415kJ.$ The ΔH

at $27°C$ is

  A. $-1410kJ$

  B. $-1420kJ$

  C. $+1420kJ$

  D. $+1410kJ$

Answer: B

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350. Given that -

$2C(s) + 2O_2(g) \rightarrow 2CO_2(g)\Delta H = -787KJ$

$H_2(g) + 1/2O_2(g) \rightarrow H_2O(l)\Delta = -286KJ$

$$C_2H_2(g) + \frac{5}{2}O_2(g) \rightarrow H_2O(l)\Delta H = -1310KJ$$
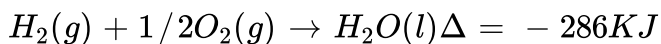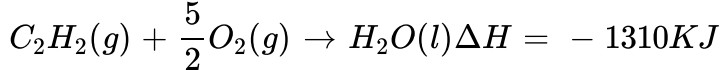
Heat of formation of acetylene is :-

A. $-1802KJ$

B. $+1802KJ$

C. $-800kJ$

D. $+228KJ$

Answer: D

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351. $C_{\text{diamond}} + O_2(g) \rightarrow CO_2(g), \Delta H = -395kJ$ ......(i)

$C_{\text{graphite}} + O_2(g) \rightarrow CO_2(g), \Delta H = -393.5KJ$ ...(ii)
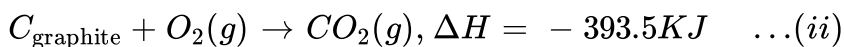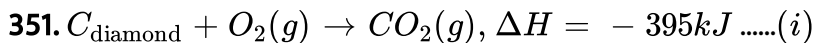
The ΔH , when diamond is formed from graphite, is

A. $-1.5kJ$

B. $+1.5kJ$

C. $+3.0kJ$

D. $-3.0kJ$

Answer: B

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352. The heats of combustion for C, H_2 and CH_4 are -349, -241.8 and $-906.7kJ$ respectively. The heat of formation of CH_4 is

A. 174.1 kJ

B. 274 kJ

C. 374.1 kJ

D. 74.1 kJ

Answer: D

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353. $N_{2(g)} + 2O_{2(g)} \rightarrow 2NO_2 + XkJ$

$2NO_{(g)} + O_{2(g)} \rightarrow 2NO_{2(g)} + YkJ$
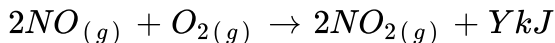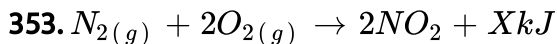
The enthalpy of formation of NO is

A. (2X-2Y)

B. X-Y

C. $\dfrac{1}{2}(Y - X)$

D. $\dfrac{1}{2}(X - Y)$

Answer: C

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354. The enthalpy of formaion of ammonia gas at 298 K is -46.11 kJ mol^{-1}.

The equaiton to which this value realtes is

A. $\dfrac{1}{2}N_2(g) + \dfrac{3}{2}H_2(g) \rightarrow NH_3(g)$

B. $N_2(g) + 3H(g) \rightarrow rNH_3(g)$

C. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

D. $\dfrac{1}{2}N_2(g) + \dfrac{3}{2}H_2(g) \rightarrow 2NH_3(l)$
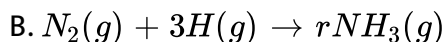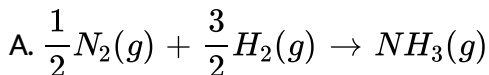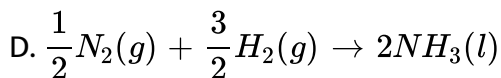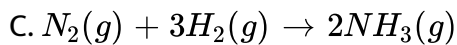
Answer: A

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355. The enthalpy change at $298K$ of the reaction

$H_2O_2(l) \rightarrow H_2O(l) + 1/2O_2(g)$ is $-23.5 kcalmol^{-1}$ and enthalpy of

formation of $H_2O_2(l)$ is $-44.8 kcalmol^{-1}$. The enthalpy of formation of

$H_2O(l)$ is

    A. $-68.$ kcal $/mol$

    B. 68.3 " kcal " / mol

    C. -91.8 kcal $/mol$

    D. 91.8 kcal $/mol$

Answer: A

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356. From the following data, the heat of formation of $Ca(OH)_2(s)$ at $18°C$ is .... Kcal.

(i) $CaO(s) + H_2O(l) = Ca(OH)_2(s), \Delta H 18°C = -15.26$ Kcal.....

(ii) $H_2O(l) = H_2(g) + 1/2O_2(g), \Delta H 18°C = 68.37$ Kcal....

(iii) $Ca(s) + 1/2O_2(g) = CaO(s), \Delta H 18°C = -151.80$ Kcal....
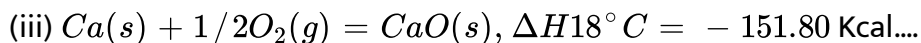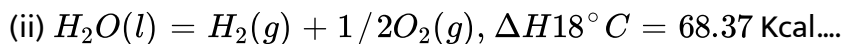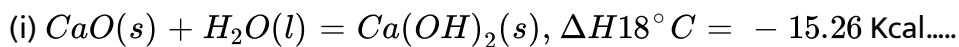
   A. -98.69

   B. -235.43

   C. 194.91

   D. 98.69

Answer: B

357. If $H_2 + 1/2O_2 \rightarrow H_2O$, $\Delta = -68.39$ Kcal

$K + H_2O + \text{water} \rightarrow KOH(aq) + 1/2H_2$, $\Delta H = -48.0$ Kcal

$KOH + \text{water} \rightarrow KOH(aq)\Delta H = -14.0$ Kcal the heat of formation

of KOH is -

A. $-68 + 48 - 14$

B. $-68 - 48 + 14$

C. $68 - 48 + 14$

D. $68 + 48 + 14$

Answer: B

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358. Given :

(i) $NH_3(g) + 3Cl_2(g) \rightarrow NCl_3(g) + 3HCl(g)$, ΔH_1

(ii) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$, ΔH_2

(iii) $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$, ΔH_3
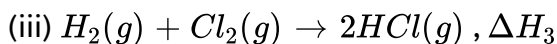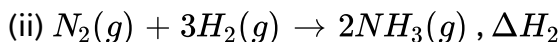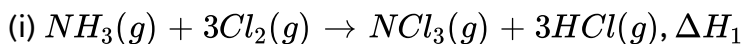
Express the enthalpy of formation of $NCl_3(g)$ (ΔH_f) in terms of ΔH_1, ΔH_2 and ΔH_3:

A. $\Delta H_f = -\Delta H_1 + \dfrac{\Delta H_2}{2} - \dfrac{3}{2}\Delta H_3$

B. $\Delta H_f = \Delta H_f + \dfrac{\Delta H_2}{2} - \dfrac{3}{2}\Delta H_3$

C. $\Delta H_f = \Delta H_f - \dfrac{\Delta H_2}{2} - \dfrac{3}{2}(\Delta H_3)$

D. None

Answer: A

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359. The heat liberated at 298 K and 1 atm 'for the formation of 365 gms. of HCl is 920 kJ. All the reactions and products are in gaseous state. Atomic mass of Cl is 35.5, enthalpy of formation of HCl is

A. $-92kJ$

B. $920kJ$

C. $-420kJ$

D. $460kJ$

Answer: A

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360. If the heat fo dissolution of anhydrous $CuSO_4$ and $CuSO_4.5H_2O$ is

$-15.89kcal$ and $2.80kcal$, respectively, then the heat of hydration of

$CuSO_4$ to form $CuSO_4.5H_2O$ is

A. -13.09 kcal

B. -18.69 kcal

C. $+13.09$ kcal

D. $+18.69$ kcal

Answer: B

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361. The enthalpy of dissolution of $BaCl_2(s)$ and $BaCl_2.2H_2O$ are -20.6 and 8.8 KJ mol^{-1} respectively . Calculate enthalpy of hydration forgiven reaction:

$$BaCl_2(s) + 2H_2O \rightarrow BaCl_2.2H_2O(s)$$
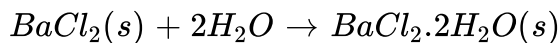
A. 29.4 kJ

B. $-29.4kJ$

C. $-11.8kJ$

D. $38.2kJ$

Answer: B

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362. $S_R + O_2(g) \rightarrow SO_2(g), \Delta H = -71.1kcalm$

$S_M + O_2(g) \rightarrow SO_2(g), \Delta H = -71.7kcal$
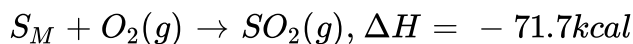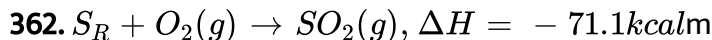
Thus ΔH for the consversion of $S_R \rightarrow S_M$ is

A. 0.6 kcal

B. -0.6 kcal

C. $+142.8$ kcal

D. -142.8 kcal

Answer: A

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363. For the change C (diamond) $\rightarrow$ C(graphite) , $\Delta H = -1.89$ KJ, if 6 g of diamond and 6g of graphite are seperately burnt to yield CO_2 the heat liberated in first case is :

A. less than in the second case by 1.89 kJ

B. less than in the second case by 11.34 kJ

C. less than in the second case by 14.34 kJ

D. more than in the second case by 0.945 kJ

Answer: D

364. The heat of combustion of yellow phosphorus and red phosphorus are -9.91 kJ/mol and -8.78 kJ/mol respectively. Then the heat of transition of yellow phosphorus to red phosphorus is

A. $-18.69kJ$

B. $+1.13kJ$

C. $+18.69kJ$

D. $-1.13kJ$

Answer: D

365. The enthalpy of formation of ammonia is -46.0 kJ mol^{-1} .The enthalpy for reaction $2N_2(g) + 6H_2(g) \rightarrow 4NH_3(g)$ is equal to

A. $- 46.0 kJ$

B. 46.0 KJ

C. $184.0 kJ$

D. $- 184.0 kJ$

Answer: D

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366. Given ehthapy of formation of $CO_2(g)$ and $CaO(s)$ are -94.0 kJ and -152 kJ respectively and the enthalpy of formation $CaCO_3(s)$ is

A. $- 42 kJ$

B. $- 202 kJ$

C. $+ 202 kJ$

D. $- 288 kJ$

Answer: D

367. The standard heats of formation of $NO_2(g)$ and $N_2O_4(g)$ are 8.0 and 2.0 Kcal mol^{-1} respectively the heat of dimerization of NO_2 in Kcal is

A. 10.2

B. -6.0

C. -12.0

D. -14.0

Answer: D

368. Values of heats of formation for SiO_2 and MgO are -48.4 and $-34.7kJ$ respectively. The heat of the reaction $2Mg + SiO_2 \rightarrow 2MgO + Si$ is

A. 21.0 kJ

B. $-21.0kJ$

C. $13.7kJ$

D. $13.7kJ$.

Answer: B

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369. The enthapies of formation of N_2O and NO are 28 and 90 kj mol^{-1} respectively. The enthalpy of the reaction, $2N_2O(g) + O_2(g) \rightarrow 4NO(g)$ is equal to

A. 8 kJ

B. 88 kJ

C. $-16kJ$

D. $304kJ$

Answer: D

---

370. The ehthalpy change taking place during the reaction $H_2O(l) \rightarrow H_2O(g)is,$ [Given $\Delta H_f = H_2O(g) = -57kcal, \Delta H_f = H_2O(l) = -68.3kcal$

A. $+11.3$ kcal

B. -11.3 kcal

C. 115.3 kcal

D. $+115.3$ kcal

Answer: A

371. $\Delta_f H° \, of \, CO_2(g), CO(g), N_2O(g)$ and $NO_2(g)$ in KJ/ mol are respectively -393 -110,81 and 34.Calculate the ΔH in kj of the following reaction:

$$2NO_2(g) + 3CO(g) \rightarrow r N_2O(g) + 3CO_2(g)$$
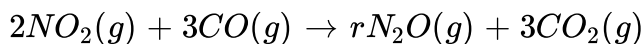
A. 836

B. 1460

C. -836

D. -1460

Answer: C

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372. If $H_2(g) + I_2(g) \rightarrow 2HI(g), \Delta H = 12.40kcal$. The enthalpy of formation of HI is

A. 12.4 kcal

B. $- 12.4$ kcal

C. $- 6.20$ kcal

D. 6.20 kcal

Answer: D

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373. The enthalpy of combustion of H_2 , cyclohexene (C_6H_{10}) and cyclohexane (C_6H_{12}) are $- 241$, $- 3800$ and $- 3920KJ$ per mol respectively. Heat of hydrogenation of cyclohexene is

A. $- 121kJ/mol$

B. $+ 121kJ/mol$

C. $- 242kJ/mol$

D. $+ 242kJ/mol$.

Answer: A

374. Considering the following reactions,

$$C + (1/2)O_2 \rightarrow CO, \Delta H = -26.4 kcal$$

$$H_2 + (1/2)O_2 \rightarrow H_2O_{(l)}, \Delta H = -57.8 kcal$$

ΔH for the reaction.

$H_2O + C \rightarrow H_2 + CO$ is
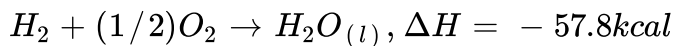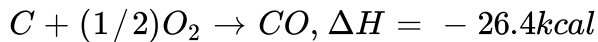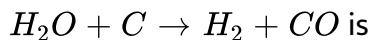
A. 62.8 kcal

B. $31.4 \ \text{kcal}$

C. $-31.4 \ \text{kcal}$

D. $-84.2 \ \text{kcal}$

Answer: B

375. The enthalpies of formation of N_2O and NO are respectively 82 and $90kJmol^{-1}$. The enthalpy of reaction $2N_2O(g) + O_2(g) \rightarrow 4NO(g)$ is
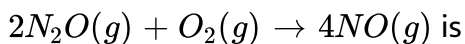
A. 8 kJ

B. 88 kJ

C. $-16kJ$

D. $196kJ$.

Answer: D

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376. Based on the following thermochemical equations,

$H_2O(g) + C(s) \rightarrow CO(g) + H_2, \Delta H = 131KJ$

$CO(g) = (1/2)O_2(g) rar CO_2(g), \Delta H = -282kJ$

$H_2(g) + (1/2)O_2(g) \rightarrow H_2O(g), \Delta H = -242kJ$
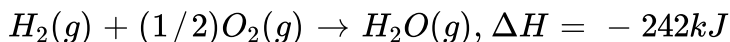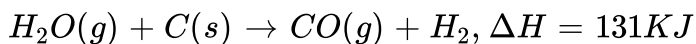
$C(s) + O_2(g) \rightarrow CO_2, \Delta H = XkJ$ the value of X will be

A. $-393kJ$

B. $-655kJ$

C. $+393kJ$

D. $+655kJ$

Answer: A

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377. The enthalpy of vapourisation of liquid water using the data :

$$H_2(g) + 1/2O_2(g) \rightarrow H_2O(l), \Delta = -285.77KJmol^{-1}$$

$$H_2(g) + 1/2O_2(g) \rightarrow H_2O(g), \Delta H = -241.84KJmol^{-1}$$
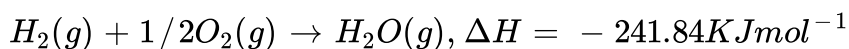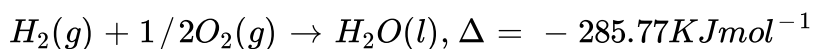
A. $+43.93kj/mo$

B. $-43.93kJ/mol$

C. $+527.61kJ/mol$

D. $-527.61kJ/mol$

378. If, $S + O_2 \rightarrow SO_2, \Delta H = -298.2kj$

$SO_2 + \dfrac{1}{2}O_2 \rightarrow SO_3, \Delta H = -98.7kJ$

$SO_3 + H_2O \rightarrow rH_2SO_4, \Delta H = -130.2kJ$

$H_2 + \dfrac{1}{2}O_2 \rightarrow H_2O, \Delta H = -227.3kJ$
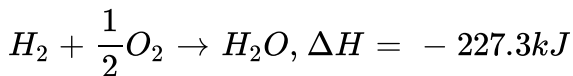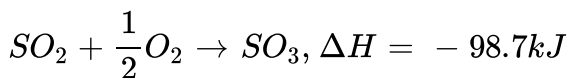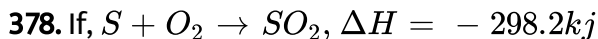
Find ΔH for formation of H_2SO_4 at 298 K.

A. $-754.4kJ$

B. $+320.5kJ$

C. $650.3kJ$

D. $-433.7kJ$

Answer: A

379. If heat of combustion of enthylene is 1411 KJ when a certain amount of ethylene was burnt 6226 KJ heat was evolved. Then the volume of O_2 (at NTP) that entered into the reaction is :-

    A. 296.5 mL

    B. 296.5 litre

    C. 6226×22.4 litre

    D. 22.4 litre

Answer: B

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380. The combution of 5.0 g of coke reaised the temperatre of 1 kg of water from $10°C$ to $47°C$ Calcuate the fuel value of coke in kcal /g .

    A. 7.4 kcal

    B. 8.4 kcal / g

C. 9.4 kcal /g

D. 6.4 kcal/

Answer: A

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381. $\Delta_f H$ value for H_2O is - 69 kcal mol^{-1}.Then that of formation of OH^- ion $(\Delta_n H = -13.7$ kcal $)$

A. -68 kcal mol^{-1}
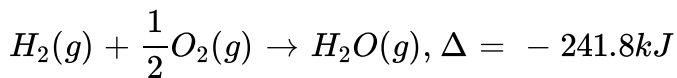
B. -54.3 kcal mol^{-1}

C. 81.7 kcal mol^{-1}

D. zero

Answer: B

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382. Find out the heat evolved in combustion if 112 litre (at 1 atm, 273 K) of water gas (mixture of equal volume of $H_2(g)$ and CO(g)) is combusted with excess oxygen.

$$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(g), \Delta = -241.8kJ$$

$$CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g), \Delta = -283kJ$$
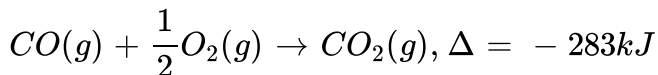
A. 241.8 kJ

B. 283 K J

C. 1312 kJ

D. $-1312kJ$

Answer: C

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383. $2.1g$ of Fe combines with S evolving $3.77KJ$. The heat of formation of FeS in KJ/mol is

A. -3.77

B. $- 1.79$

C. $- 100.5$

D. $- 20.10$

Answer: C

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384. Given that ,

$$A(s) \rightarrow A(l)\Delta H = x$$

$$A(l) \rightarrow A(g), \Delta H = y$$
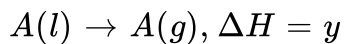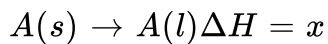
The heat of sublimation of A will be :

A. x-y

B. x+y

C. x or y

D. $- (x + y)$

Answer: B

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385. A person requires $2870 kcal$ of energy to lead normal daily life. If heat of combustion of cane sugar is $-1349 kcal$, then his daily comsumption of sugar is :
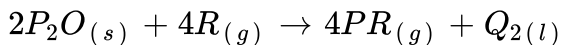
    A. 728 g

    B. 0.728 g

    C. 342 g

    D. 0.342 g

Answer: A

386. Enthalpy change for the reaction given below at constant volume is 200 kJ. The heat change at constant pressure for the same reaction at the same temperature would be.

$$2P_2O_{(s)} + 4R_{(g)} \rightarrow 4PR_{(g)} + Q_{2(l)}$$

A. 600 kJ

B. 100 KJ

C. 800 KJ

D. 200 KJ

Answer: D

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387. One moles of anhydrous AB dissolves in water and liberates $21.0 Jmol^{-1}$ of heat. The valueof $\Delta H^{\ominus}$ (hydration) of AB is $-29.4 Jmol^{-1}$. The heat of dissolution of hydrated salt $AB.2H_2O(s)$ is

A. $50.4 J mol^{-1}$

B. $8.4 J mol^{-1}$

C. $-50.4 J mol^{-1}$

D. $-8.4 J mol^{-1}$

Answer: B

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388. The molar heat of vapourisation for water is 9.72 kcal mol^{-1} .The amount of heat change when 36 gms of steam condense is

A. 293 kcal

B. 19.45 kcal

C. 22.4 kcal

D. 9.72 kcal

Answer: B

389. An athlete is given glucose of energy equivalent to 880 kJ. He utilise 50 % of this gain energy in the event.the order to avoid storage would need to perspire is (enthalpy of evaporation of water is 44 kJ mole^{-1}

A. 18 g

B. 1.8 g

C. 1800 g

D. 180 g

Answer: D

390. Combustion of glucose takes place as

$$C_6H_{12}O_6 + 6O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O_{(g)}$$
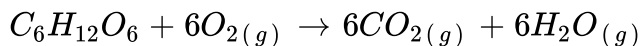
$\Delta H = -72$ kcal / mole

The energy needed for the production of 1.8 g of glucose by photosynthesis will be 0.82 k cal

A. 0.82 k cal

B. 0.72 k cal

C. 8.2 k cal

D. 7.2 kcal

Answer: B

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391. The ethalpy of combustion of sucrose $(C_{12}H_{22}O_{11})$ is 1350 kcal . Amount of heat liberated when 342 gm of sucrose is burnt is

A. 13.5 k cal

B. $13.5 \times 10^2 kcal$

C. $1.35 \times 10^4 kcal$

D. $1.35 kcal$

Answer: B

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392. $H_2(g) + Cl_2(g) = 2HI(g), \Delta H_{298K} = -92.01 kJ.$,

For this reaction , ΔU is equal to

A. 12.4

B. -12.40

C. 6.2

D. -6.20

Answer: C

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393. $H_2(g) + Cl_2 = 2HCl(g), \Delta H(298K) = -92.01 kJ.$
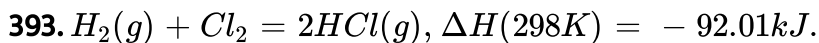
For this reaction ΔU is equal to

    A. $-92.06 + 2 \times 10^{-3} \times 298 \times 2J$

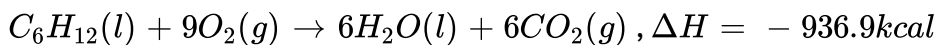   B. $-92.06 + 2 \times 298 kJ$

    C. $-92.06 - 2 \times 298 \times 4kJ$

    D. $-92.06 kJ$

Answer: D

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394. For the reaction

$C_6H_{12}(l) + 9O_2(g) \rightarrow 6H_2O(l) + 6CO_2(g), \Delta H = -936.9 kcal$

Which of the following is true ?

    A. $-936.9 = \Delta U - (2 \times 10^{-3} \times 298 \times 3)$ kcal

    B. $+936.9 = \Delta U + (2 \times 10^{-3} \times 298 \times 3)$ kcal

C. $-936.9 = \Delta U - \left(2 \times 10^{-3} \times 298 \times 2\right)$ kcal

D. $-936.9 = \Delta U + \left(2 \times 10^{-3} \times 298 \times 2\right)$ kcal

Answer: A

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395. Which compound will absorb the maximum amount of heat when dissolved in the same amout of heat water ? (Internal heats of solution at $25°$ C in kcal/ mol of eaxh solute are given in brackets).

A. $HCl(\Delta H = -17.74)$

B. $HNO_3(\Delta H = -7.85)$

C. $NH_4NO_3(\Delta H = +16.08)$

D. $NaCl(\Delta H = +1.02)$

Answer: C

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396. Given that standard heat enthalpy of CH_4, C_2H_4 and C_3H_8 are -17.9, 12.5, -24.8 Kcal/mol. The ΔH for $CH_4 + C_2H \rightarrow C_3H_8$ is :

A. -55.2 kcal

B. -30.2 kcal

C. 55.2 kcal

D. -19.4 kcal

Answer: D

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397. The bond dissociation energy of gaseous H_2, Cl_2 and HCl are $104, 58$ and $103 kcalmol^{-1}$ respecitvely. Calculate the enthalpy of formation for HCl gas.

A. -44 kcal

B. -88 kcal

C. -22 kcal

D. -11 kcal

Answer: C

398. If enthalpy of formation of Cl_4 is 316 kcal mol^{-1} the dissociation energy of $C-Cl$ is

A. 79 kcal mol^{-1}

B. 316 kcal mol^{-1}

C. 97 kcal mol^{-1}

D. 158 kcal mol^{-1}

Answer: A

399. Energy required to dissociate $4g$ of gaseous hydrogen into free gaseous atoms is $208Kcal$ at $25°C$

The bond energy of $H - H$ bond will be

A. 104 kcal

B. 10.4 kcal

C. 1040 kcal

D. 104 kcal

Answer: A

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400. Heat evolved in the reaction.
$\frac{1}{2}N_2 + \frac{3}{2}H_2 \rightarrow NH_3$ is 46 kJ. Bond energies of

H - H and N = N are 436 and 712 kJ/mol respectively. The avrage N - H bond

energy is

A. 352kJ mol^{-1}

B. q

C. 336kJ mol^{-1}

D. 154kJ mol^{-1}

Answer: A

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401. Heat evolved in the reaction

$H_2 + Cl_2 \rightarrow 2HCl$ is 182 kJ Bond energies H- H = 430 kJ/mole, $Cl - Cl = 242kJ/\text{mole}$. The H-Cl bond energy is

A. 763 kJ/mol

B. 427 kJ/mol

C. 336 kJ/mol

D. 154 kJ/mol

Answer: B

402. The dissociation energy of CH_{40} and C_2H_6 are respectively 360 and $620 kcal/mol.$ The bond energy of $C - C$ bond is :

A. 260 kcal/mol

B. 180 kcal/mol

C. 130 kcal/mol

D. 80 kcal/mol

Answer: D

403. The bond energies of C-C, C = C, H - H and C - H linkages are 350, 600, 400 and 410 kJ per mol respectively. The enthalpy of hydrogenation of

ethylene is

A. -170kJ mol^{-1}

B. -260kJ mol^{-1}

C. -400kJ mol^{-1}

D. -450kJ mol^{-1}

Answer: A

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404. The bond dissociation energy of C-H in CH_4 from the equation

$$C(g) + 4H(g) \rightarrow CH_4(g), \qquad \Delta H = -397.8kcal$$
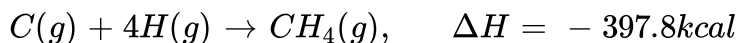
is:

A. $+397.8kJ$

B. $+198.9kJ$

C. $+99.45kJ$

D. $-99.45kJ$

Answer: D

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405. Given the following data :

$\Delta H_f(C_2H_4) = 12.5$ kcal

Enthalpy of atomisation of C =171 kcal

Enthalpy of atomisation of H = 53 .1 kcal

Bond energy of C-H bond =99.3 kcal

What is C = C bond energy ?

A. 140.7 kcal

B. 36 kcal

C. 40 kcal

D. 76 kcal

Answer: A

406. The enthalpy of formation of water from hydrogen and oxygen is _286 kJ mol^{-1} The enthalpy of decomposition of water into hydrogen and oxygen is

A. $-286\ \text{kJ mol}^{-1}$

B. -141kJ mol^{-1}

C. $+286\text{kJ mol}^{-1}$

D. $+143\text{kJ mol}^{-1}$

Answer: C

407. Given the bond energies $N-N$, $N-H$ and $H-H$ bond are $945, 436$ and $391KJmol^{-1}$ respectively, the enthalpy change of the

reaction

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ is
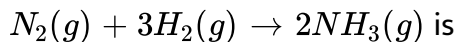
A. $- 93kJ$

B. 102 kJ

C. 90 kJ

D. 105 kJ.

Answer: A

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408. The table given below lists the bond dissociation energy (E_{diss}) for

single covalent bonds formed between C and atoms A, B, D, E.

Bond	$E_{\text{diss}}\left(\text{kcal mol}^{-1}\right)$
$C - A$	240
$C - B$	382
$C - D$	276
$C - E$	486

Which of the atoms has smallest size ?

A. D

B. E

C. A

D. B

Answer: B

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409. The enthalpy of formation of HBr, H atom and Br atoms are - 36.2, 215 and 94 kJ mol^{-1} respectively. The bond energy of HBr bond would be

A. $272.8kJ$ mole $^{-1}$

B. $345.2kJmol^{-1}$

C. $581.8kJmol^{-1}$

D. 618. kJ mol

Answer: B

410. $H_2(g) = 2H(g), \Delta H = 104.2$kcal. The bond energy of H-Hbond is

A. 104.2 kcal

B. 208.4 kcal

C. 52.1 kcal

D. Zero

Answer: A

411. The enthalpy of vaporisation of a substance is 840 J mol^{-1} and its boiling point is -173°C. Its entropy of vaporisation is

A. $8.4 J mol^{-l} K^{-1}$

B. $21 J K^{-1} mol^{-l}$

C. $49 Jmol^{-l}K^{-1}$

D. $12JK^{-1}mol^{-1}$

Answer: A

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412. For the reduction of lead oxide by coke $(PbO + C \rightarrow Pb + CO)$, ΔH and ΔS are found to be $108.8kJmol^{-1}$ and $190JK^{-1}mol^{-1}$ respectively. The minimum temperature above which the reaction will be spontaneous will be

A. $100°C$

B. $200°C$

C. $300°C$

D. $400°C$

Answer: C

413. Calculate the temperature at which $\Delta G = -5.2kJmol^{-1}$,DeltaH=145.6kJmol^-1 and DeltaS=216 JK^-1mol^-1` for a chemical reaction

A. $698°C$

B. $425°C$

C. $650°$

D. $550°C$

Answer: B

414. 1 g ice absorbs 335 J of heat to melt at 0°C. The entropy change will be

A. $1.2JK^{-1}mol^{-1}$

B. $335JK^{-1}mol^{-l}$

C. $22.1JK^{-1}mol^{-l}$

D. $8.0JK^{-1}mo^{-l}$

Answer: C

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415. Calculate the free energy change for the following reaction at 300 K.

$2CuO_{(s)} \rightarrow Cu_2O_{(s)} + \frac{1}{2}O_{2(g)}$ Given $\Delta H = 145.6kJmol^{-1}$ and
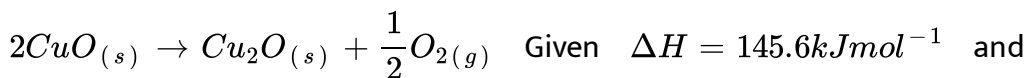
$\Delta S = 116.\ JK^{-1}mol^{-1}$

A. $110.8kJmol^{-1}$

B. $221.5kJmol^{-1}$

C. $55.4kJmol1^{-1}$

D. $145.6kJmol1^{-1}$

Answer: A

416. One mole of ice is converted into water at 273 K. The entropies of $H_2O(s)$ and $H_2O(l)$ are 38.20 and 60.01 J $mol^{-1}K^{-1}$ respectively. Calculate the enthalpy change for this conversion a ?

A. 59.59 J/mol

B. 595.95 J/mol

C. 5959.5 J/rnol

D. 595959.0 J/mol

Answer: D

417. Given the following entropy values (in $JK^{-1}mol^{-1}$) at 298 K atm : $H_2(g): 130.6$. $Cl_2(g): 223.0$ and $HCl(g): 186.7$. The entropy change (in

$JK^{-1}mol^{-1}$ for the reaction

$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$ is
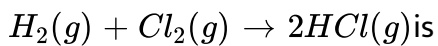
A. $+540.3$

B. $+727.0$

C. -166.9

D. 19.8

Answer: A

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418. If the enthalpy of vaporisation of water is $186.5 Jmol^{-1}$, then entropy of its vaporisation will be

A. $0.5 JK^{-1}mol^{-1}$

B. $1.0 JK^{-1}mol^{-1}$

C. $1.5 JK^{-1}mol^{-1}$

D. $2.0 JK^{-1}mol^{-1}$

Answer: B

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419. The standard state Gibbs's energy change for the isomerisation reaction $cis - 2 - pentence \Leftrightarrow trans - 2 - pentence$ is $-3.67kJmol^{-1}$ at $400K$. If more $trans - 2 - pentence$ is added to the reaction vessel, then:

A. additional trans-2-pentene is formed

B. more cis-2-pentene is formed

C. equilibrium is shifted in the forward direction

D. equilibrium remains unaffected.

Answer: B

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420. For the given reaction:

$$H_2(g) + Cl_2(g) \rightarrow 2H^+(aq) + 2Cl^-(aq)$$
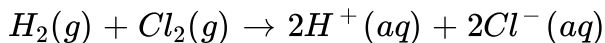
$$\Delta G^\circ = -262.4kJ$$

The value of Gibbs free energy of formation (ΔG_r°) for the ion $Cl^-(aq)$ is:

A. $-131.2 kJmol^{-1}$

B. $+131.2 kJmol^{-1}$

C. $-262.4 kJmol^{-1}$

D. $+262.4 kJmol^{-1}$

Answer: A

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QUESTION FROM COMPETITIVE EXAM

1. For an endothermic reaction where ΔH represent the enthalpy of reaction in kj/mol, the minimum value for the energy of activation will be:

    A. less than ΔH

    B. equal to ΔH

    C. more than ΔH

    D. equal to zero

Answer: C

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2. Standard entropy of X_2, Y_2 and XY_3 are 60, 40 and $50 JK^{-1}mol^{-1}$, respectively. For the reaction, $\dfrac{1}{2}X_2 + \dfrac{3}{2}Y_2 \rightarrow XY_3, \Delta H = -30KJ$, to be at equilibrium, the temperature will be:

    A. 750K

B. 1000 K

C. 1250 K

D. 500 K

Answer: A

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3. Match List I (Equations) with List II (Type of processes) and select the correct option.

List I Equations	List II Type of process
A) $K_p > Q$	i) Non - spontaneous
B) $\Delta G° < RT \ln Q$	ii) Equilibrium
C) $K_p = Q$	iii) Spontaneous and endothermic
D) $T\Delta S > \Delta H$	iv) Spontaneous

A. A- (i), B - (ii), C - (iii), D - (iv)

B. A - (iii), B - (iv), C - (ii), D - (i)

C. A - (iv), B - (i), C - (ii), D - (iii)

D. A - (ii), B - (i), C - (iv), D - (iii)

Answer: C

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4. Three moles of an ideal gas expanded spontaneously into vacuum. The work done will be

A. Infinite

B. 3 Joules

C. 9 Joules

D. Zero

Answer: D

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5. For vaporization of water at 1 atmospheric pressure the values of ΔH and ΔS are $40.63 KJmol^{-1}$ and $108 JK^{-1}mol^{-1}$, respectively. The temperature when Gibbs energy change (ΔG) for this transformation will be zero is

    A. 273.4 K

    B. 393.4 K

    C. 373.4 K

    D. 293.4 K

Answer: C

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6. The following two reactionas are known

$FeO_3(s) + 3CO(g) \rightarrow 2Fe(s) + CO_2(g) :$

$\Delta H = -26.8KJ$

$$FeO(s) + CO(g) \rightarrow Fe(s) + CO_2(g) : \Delta H = -16.5KJ$$
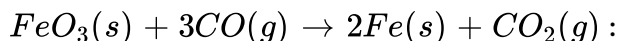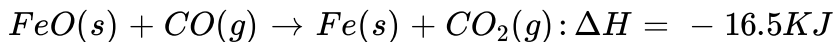
The value of ΔH for the following reaction

$Fe_2O_3(s) + CO(g) \rightarrow 2FeO_2(s) + CO_2(g)$ is
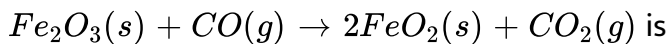
A. $+10.3kJ$

B. $-43.3kJ$

C. $-10.3kJ$

D. $+6.2kJ$

Answer: D

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7. If the enthaply change for the transition of liquid water to steam is 30

KJ mol^{-1} at $27°$ C. The entropy change for the process would be

A. $10Jmol^{-1}K^{-1}$

B. $1.0Jmol^{-1}K^{-1}$

C. $0.1Jmol^{-1}K^{-1}$

D. $100 Jmol^{-1}K^{-1}$

Answer: D

8. Enthalpy change for the reaction, $4H_{(g)} \rightarrow 2H_{2(g)}$ is -869.6 kJ

The dissociation energy of H-H bond is :

A. $-434.8 kJ$

B. $-869.6 kJ$

C. $+434.5 kJ$

D. $+217.4 kJ$

Answer: C

9. Consider the following processes :-

$$\Delta H(kJ/mol)$$

$\frac{1}{2}A \rightarrow B$ $+150$

$3B \rightarrow 2C + D$ -125

$E + A \rightarrow 2D$ $+350$

For $B + D \rightarrow E + 2C$, ΔH will be

A. 525 kJ / mol

B. $-275k\dfrac{J}{m}ol$

C. $-325k\dfrac{J}{m}ol$

D. 325 kJ / mol

Answer: B

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10. In view of the signs of $\Delta_r G^0$ for the following reactions

$PbO_2 + Pb \rightarrow 2PbO, \Delta_r G^0 < 0$

$SnO_2 + Sn \rightarrow 2SnO, \Delta_r G^0 > 0$
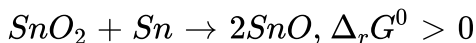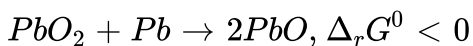
Which oxidation state are more characteristic for lead and tin?

A. For lead + 4, for tin+ 2

B. For lead+ 2, for tin+ 2

C. For lead + 4, for tin + 4

D. For lead + 2, for tin+ 4

Answer: D

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11. The value of enthalpy change (ΔH) for the reaction

$$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$$
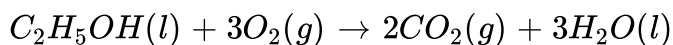
at $27°C$ is $-1366.5kJmol^{-1}$.

The value of internal energy change for the above reactio at this temperature will be

A. $-1371.5kJ$

B. $-1369.0kJ$

C. $-1364.0kJ$

D. $-1361.5kJ$

Answer: C

---

12. Consider the reaction,

$4NO_2(g) + O_2(g) \rightarrow 2N_2O_5(g), \Delta_rH = -111kJ.$ If $N_2O_5(s)$ is

formed instead of $N_2O_5(g)$ in the above reaction, the Δ_rH value will be

(Given, ΔH of sublimation for N_2O_5 is $54kJmol^{-1}$)
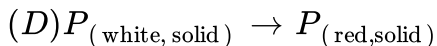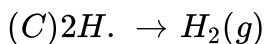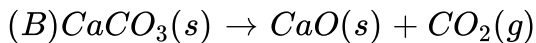
A. $-165kJ$

B. $+54kJ$

C. $+219kJ$

D. $-219kJ$

Answer: A

13. Match the transformation in colums I with appropriate options in column II.

Column I

$(A)CO_2(s) \rightarrow CO_2(g)$
$(B)CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$
$(C)2H. \rightarrow H_2(g)$
$(D)P_{(\text{white, solid})} \rightarrow P_{(\text{red,solid})}$
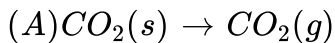
Column II

(p)phase transition
(q)allotropic change
$(r)\Delta H$is positive
$(s)\Delta S$is positive
$(t)\Delta S$is negative

A. A-r

B. B - s

C. C-p

D. D-q

Answer: D

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14. The entropy change involved in the isothermal reversible expansion of 2 moles of an ideal gas from a volume of $10dm^3$ to a volume of $100dm^3$

at $27°C$ is

A. $35.8 \text{ J mol}^{-1}K^{-1}$

B. $32.3\text{J mol}^{-1}K^{-1}$

C. $42.3\text{J mol}^{-1}K^{-1}$

D. $38.3\text{J mol}^{-1}K^{-1}$

Answer: D

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15. Which of the following is correct option for the free expansion of an ideal gas under adiabatic condition ?

A. $q = 0, \Delta T \neq 0, W = 0$
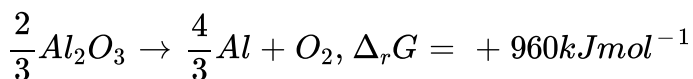
B. $q \neq 0, \Delta T = 0, W = 0$

C. $q = 0, \Delta T = 0, W = 0$

D. $q = 0, \Delta T < 0, W = 0$

Answer: C

16. The Gibbs energy for the decomposition of Al_2O_3 at $500°C$ is as follow :

$$\frac{2}{3}Al_2O_3 \rightarrow \frac{4}{3}Al + O_2, \Delta_rG = +960kJmol^{-1}$$

The potential difference needed for the electrolytic reduction of aluminium oxide (Al_2O_3) at $500°C$ is

A. $-4.5V$

B. 3.0

C. $-2.5V$

D. $5.0V$

Answer: C

17. The entropy change involved in the isothermal reversible expansion of 2 moles of an ideal gas from a volume of $10dm^3$ to a volume of $100dm^3$ at $27°C$ is

A. $-35.8kJ$

B. $-11.49kJ$

C. $-32.3kJ$

D. $-38.29kJ$

Answer: B

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18. The incorrect expression among the following is

A. $\dfrac{\Delta G_{\text{system}}}{\Delta S_{\text{total}}} = -T$

B. In isothermal process

$$W_{rev} = -nRT\ln\dfrac{V_r}{V_r} = -T$$

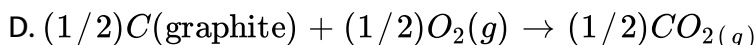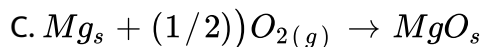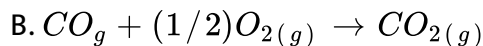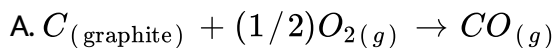C. $\ln K = \dfrac{T\Delta S^o - \Delta H}{RT}$

D. $K = e^{-\Delta G^o}/RT$

Answer: C

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19. In which of the following reactions,standard reaction entropy change $(\Delta S^\circ)$is positive and standard Gibb,s energy change(ΔG°)decreases sharply with increasing temperature?

A. $C_{(\text{graphite})} + (1/2)O_{2(g)} \rightarrow CO_{(g)}$

B. $CO_g + (1/2)O_{2(g)} \rightarrow CO_{2(g)}$

C. $Mg_s + (1/2))O_{2(g)} \rightarrow MgO_s$

D. $(1/2)C(\text{graphite}) + (1/2)O_2(g) \rightarrow (1/2)CO_{2(g)}$

Answer: A

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20. The enthalpy of fusion of water is $1.435 kcal/\text{mole}$. The molar entropy change for melting of ice at $0°C$ is

A. 10.52 cal/(mol K)

B. 21.04 cal/(mol K)

C. 5.260 cal/(mol K)

D. 0.526 cal/(mol K)

Answer: D

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21. Standard enthalpy of vaporisationΔV_{vap}. $H^{\ominus}$ for water at $100°C$is $40.66 kJmol^{-1}$.The internal energy of Vaporization of water at $100°C\left(\text{in kJ mol}^{-1}\right)$is

A. 37.56

B. -43.736

C. $+43.76$

D. $+40.56$

Answer: A

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22. A piston filled with 0.04 mol of an ideal gas expands reversibly from $50.0mL$ to $375mL$ at a constant temperature of $37.0°C$. As it does so, it absorbs $208J$ of heat. The value of q and w for the process will be: $(R = 8.314J/molK)(\ln 7.5 = 2.01)$

A. q = + 208 J, W = + 208 J

B. q = + 208 J, W = - 208 J

C. q = - 208 J, W = - 208 J

D. q = - 208 J, W = + 208 J

Answer: B

---

23. At $27°C$, one mole of an ideal gas is compressed isothermally and reversibly from a pressure of 2 atm to 10 atm. Calculate ΔU and q.

A. 0, - 965.84 cal

B. $-965.84 cal, \ -865.58 cal$

C. $+865.58 cal, \ -865.58 cal$

D. $+965.84 cal, \ +865.58 cal$

Answer: A

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24. A piston filled with 0.04 mol of an ideal gas compress reversibly from 50.0 mL to 375 mL at a constant temperature of $37.0°C$. As it does so, it

evolve 200 J of heat. The values of q and w for the process will be

A. q = - 200 J, W = + 200 J

B. q = - 200 J, W = - 200 J

C. q = + 200 J, W = - 200 J

D. q = + 200 J, W = + 200 J

Answer: A

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25. Pressure-volume (PV) work done by an ideal gaseous system at constant volume is (where U is internal energy of the system)

A. $\Delta P / P$

B. zero

C. $-V\Delta P$

D. $-\Delta U$

Answer: B

26. The change of entropy is defined as

A. ds = sq/T

B. ds = dH/T

C. $ds = q_{\text{eqv}}/T$

D. ds = (dH-dG)/T

Answer: C

27. The condition of spontanity of process is

A. Lowering of entropy of constant temperature and pressure

B. Lowering of Gibbs free energy of system at constant temperature and pressure

C. Increase of Entropy of system at constant temperature and pressure

D. Increase of Gibbs free Energy of the universe at constant tempearture and pressure

Answer: B

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28. Mixing of two different ideal gass under isothermal reversible condition will lead to

A. Increase of Gibbs free energy of system

B. No change of enetropy of the system

C. Increase of entropy of the system

29. For the complete combustion of ethanol, $C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$ the amount of heat produced as measured in bomb calorimeter is $1364.47KJmol^{-1}$ at $25°C$. Assuming ideality, the enthalpy of combustion, ΔH_C, for the reaction will be

$[R = 8.314JK^{-1}mol^{-1}]$

A. -1366.95 kJ mol^{-1}

B. -1361.95kJ mol^{-1}

C. -1460.50kJ mol^{-1}

D. -1350.50kJ mol^{-1}

Answer: A

30. When 5 litres of a gas mixture of methane and propane is perfectly com busted at $0°C$ and 1 atmosphere, 16 liters of oxygen at the same temprature and pressure is consumed. The amount of heat released from this combustion m kJ.

$[\Delta H_{comb}(CH_4) = -890 kJmol^{-1}, \Delta H_{comb}(C_3H_8) = -2220 kJmol^{-1})]$
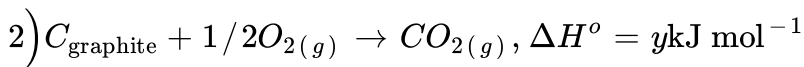
A. 38

B. 317

C. 477

D. 32

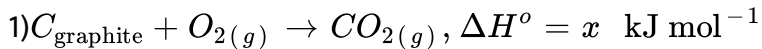Answer: B

31. Three thermochemical eq^{ns} are given below

1) $C_{graphite} + O_{2(g)} \rightarrow CO_{2(g)}, \Delta H^o = x$ kJ mol^{-1}

2) $C_{graphite} + 1/2O_{2(g)} \rightarrow CO_{2(g)}, \Delta H^o = y$kJ mol^{-1}

3) $CO_{(g)} + 1/2O_{2}(g) \rightarrow CO_{2(g)}, \Delta H^o = z$ kJ mol^{-1}

Base on the above eq^{ns} find out which of the relationship given below is correct

    A. z=x+y

    B. x=y+z

    C. y = 2z - x

    D. x = y - z

Answer: B

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32. The standard Gibbs free energy change (ΔG^0) 25°C for the dissocitation of $N_2O_{4(g)}$ to$NO_{2(g)}$ (given equilibrium constant = 0.15, R =
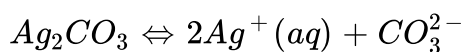
$8.314 \ JK^{-1} mol^{-1}$

A. 1.1 kJ

B. 4.7 kJ

C. 8.1 kJ

D. 38.2 kJ

Answer: B

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33. Using the Gibbs energy change, $\Delta G^{\circ} = +63.3 kJ$, for the following reaction,

$Ag_2 CO_3 \Leftrightarrow 2Ag^+(aq) + CO_3^{2-}$

the K_{sp} of $Ag_2 CO_3(s)$ in water at $25^{\circ} C$ is

$\left(R = 8.314 JK^{-1} mol^{-1} \right)$

A. $2.9 X 10^{-3}$

B. $2.9 X 10^{-3}$

C. $3.2x10^{-26}$

D. $8.0x10^{-12}$

Answer: D

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34. For the reaction,

$X_2O_4(l) \rightarrow 2XO_2(g), \Delta E = 2.1Kcal$,
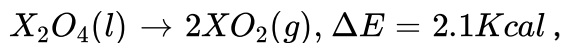
$\Delta S = 20cal/K$ at $300K$. Hence ΔG is

A. 9.3 kcal

B. -9.3kcal

C. 2.7 kcal

D. 2.7 kcal

Answer: D

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35. For the process $H_2O(l) \rightarrow H_2O(g)$ at $t = 100°C$ and 1 atmosphere pressure, the correct choice is:

A. $\Delta S_{\text{system}} > 0$ and $\Delta S_{\text{surrounding}} > 0$

B. $\Delta S_{\text{system}} > 0$ and $\Delta S_{\text{surrounding}} < 0$

C. $\Delta S_{\text{system}} < 0$ and $\Delta S_{\text{surrounding}} > 0$

D. $\Delta S_{\text{system}} < 0$ and $\Delta S_{\text{surrounding}} < 0$

Answer: B

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