Q1. A spherical ball of radius 7 cm contains 56 percent iron . Its density is 1.4 g/cm$^3$ .the number of moles of Fe present approximately is

(1) 10
(2) 15
(3) 30
(4) 25

Q2. If the equivalent weight of an element is 32 then the percentage of oxygen in its oxide is

(1) 16
(2) 40
(3) 32
(4) 20

Q3. How many moles of electrons weigh one kilogram (mass of electron = 9.31 X $10^{-31}$ kg)

(1) $6.023 \times 10^{23}$
(2) $\frac{10^{31}}{9.108}$
(3) $10^{54} \times \frac{6023}{9.108}$
(4) $\frac{10^{8}}{(9.108 \times 6.023}$

Q4. When a certain metal was irradiated with light of frequency $3.2 \times 10^{16}\ Hz$ photoelectrons emitted had twice the kinetic energy as did photoelectrons emitted when the same metal was irradiated with a light of frequency $2.0 \times 10^{16}\ Hz$ the threshold frequency is ( h = 6.63 X $10^{-34}$ J-s)

(1) $8 \times 10^{13}\ Hz$
(2) $8 \times 10^{15}\ Hz$
(3) $8 \times 10^{14}\ Hz$
(4) $6.4 \times 10^{16}\ Hz$

Q5.If the radius of the first Bohr orbit is x ,the de-Broglie wavelength of the electron in 3$^{rd}$ orbit of H atom is nearly

(1) $2x\pi$
(2) $6x\pi$
(3) 9x
(4) X /3

Q6. To remove the electron in a H atom from the ground state to a excited state, 12.084 eV is needed. How much energy is needed to excite 1 mol of H atoms to undergo this transition (1eV = 1.6 X $10^{-19}$ J)

(1) 728 kJ
(2) 984 KJ
(3) 1036 kJ
(4) 1164 kJ

Q7. Select the correct statement :

(1) Radial part is dependent on r and angular part is dependent on $\theta\ and\ \varphi$
(2) Angular wave function "$\theta\varphi$ " depends only on l and $m_l$ independent on n for a given type of orbital.
(3) Both are correct
(4) None is correct.

Q8. The Bohr model can explain the spectrum of :

(1) the hydrogen atom only
(2) An atom or ion having one electron only
(3) The hydrogen molecule only
(4) The sodium atom only

Q9. The 'd' orbital which has maximum probability density lying along two axes is as :

(1) $d_{x^2-y^2}$
(2) $d_{z^2}$
(3) $d_{xy}$
(4) $d_{zx}$

Q10. Which one of the following orbitals gives an electron a greater probability of being found close to the nucleus ?

(1) 3s
(2) 3p
(3) 3d
(4) 5g

Q11. A 10 cm column of air is trapped by a column of Hg 4 cm long in capillary tube of uniform bore when the air column is held horizontally in a room at 1 atm . Length of the air column when the tube is held vertically with the open end up is :

(1) 9.5 cm
(2) 10.52 cm
(3) 3.53 cm
(4) 4. 61 cm

Q12. Rate of effusion of LPG (a mixture of n – butane and propane ) is 1.25 times that of sulphur trioxide . Hence , mass fraction of n – butane in LPG is :

(1) .75
(2) .25
(3) .5
(4) .67

Q13. Ideal gas equation in terms of KE per unit volume , E is p =

(1) 3RT /2
(2) 2E/ 3
(3) 2RT/ 3
(4) 3E/2

Q14. The compressibility factor of gas is less than unity at STP , therefore :

(1) $V_m(molar\ volume) > 22.4\ L$
(2) $V_m < 22\ .4\ L$
(3) $V_m = 22.4\ L$
(4) $V_m\ = 44.8\ L$

Q15. The pressure on a sample of water at its triple point is reduced while the temperature is held constant .Which of the phase changes are favoured ?

(a) Fusion
(b) Sublimation
(c) Vapourisation

(1) Only (a)

(2) . only (b) and (c)

(3). Only (a) and (b)

(4). Only (b) and (c)

Q16. The triple point of carbon dioxide occurs at 5.1 atm and – 50$^0$C . Its critical temperature is 31 $^0$C and solid carbon dioxide is more dense than liquid carbon dioxide . Under what conditions is liquid carbon dioxide stable at equilibrium ?

(1) 10 atm and – 25$^0$C
(2) 5.1 atm and -25$^0$C
(3) 10 atm and 33$^0$C
(4) 5.1 atm and -100$^0$C

Q17. In the particular reaction we start with 2 moles of nitrogen and 5 moles of hydrogen ,exerting a total pressure of 7 atm at a given temperature in a closed vessel. At equilibrium 50% nitrogen is converted to ammonia. (Assume constant temperature) the partial pressure of ammonia is : $2N_2\ (g) + 3H_2\ (g) \rightarrow 2NH_3\ (g)$

(1) 2. 8 atm
(2) 2 atm
(3) 3.2 atm
(4) 4 atm

Q18. When a liquid is in equilibrium with its vapour , thermodynamic criterion for equilibrium is :

(1) Entropy of the liquid phase is greater than entropy in the vapour phase
(2) Enthalpy of the liquid phase is less than enthalpy in the vapour phase
(3) Chemical potential in the liquid phase is equal to chemical potential in the vapour phase
(4) Gibbs free energy of the two phases is different

Q19. Identify the correct statement regarding

Entropy :

(1) At absolute zero of temperature ,the entropy of the perfectly crystalline substance is taken to be zero.
(2) At absolute zero of temperature the entropy of a perfectly crystalline substance is positive
(3) At absolute zero of temperature the entropy of all the crystalline substances is be zero
(4) At $0^0$C , the entropy of a perfectly crystalline substance is taken to be zero.

Q20. The work done during the expansion of a gas from a volume of 4 $dm^3$ to 6 $dm^3$ against constant external pressure of 3 atm is : ( 1 L atm = 101.32 J )

(1) -6 J
(2) -608J
(3) +304 J
(4) -304 J

Q21. For the reaction , at constant temperature , of $27^0$ C

$$C_3H_8\,(g) + 5O_2\,(g) \rightarrow 3\,CO_2(g) + 4H_2O\,(L)$$

$\Delta H - \Delta E$ is :

(1) +3RT
(2) –RT
(3) +RT
(4) -3RT

Q22. The change in entropy when one mole of an ideal gas is compressed to one-fourth of its initial volume and simultaneously heated to twice its initial temperature (in Kelvin scale) is :

(1) ( $C_V$ -R) ln4
(2) ( $C_V$ -2R) ln2
(3) ( $C_V$ -2R) ln4
(4) ( $C_V$ +2-R) ln2

Q23. A certain reaction is exothermic by 220 kJ and does 10kJ of work. What is the change in the internal energy of the system ?

(1) +230 kJ
(2) -230 kJ
(3) -210 kJ
(4) +210 kJ

Q24. For a particular reaction , $\Delta H^0 = -38.3\ kJ$ and $\Delta S^0$ = -113 J/K . This reaction is

(1) Spontaneous at all temperatures
(2) Non –spontaneous at all temperatures
(3) Spontaneous at a temperature below 338 K
(4) Spontaneous at a temperature above 338 K

Q25. When one mole of an ideal gas expands from 5.0 $dm^3$ to 25 $dm^3$ isothermally at $25^0$C ,it yields 3.99 kJ of work. The process of expansion is :

(1) Reversible
(2) Irreversible
(3) Without change in entropy
(4) Against $P_{ext}$ = 0