NEW STANDARD ACADEMY

Marks: 60

Date : 09-09-24 **CLASS : 11TH JEE** **Time: 3 HRS**

PHYSICS

1. A force of $F = 2x\hat{\imath} + 2\hat{\jmath} + 3z^2\hat{k}$ N is acting on a particle. Find the work done by this force in displacing the body from (1, 2, 3) m to (3, 6, 1) m.
   (a)-10 J
   (c) 10 J
   (b) 100 J
   (d) 1J
2. Two identical 5 kg blocks are moving with same speed of 2 m/s towards each other along a frictionless horizontal surface. The two blocks collide, stick together and come to rest. Consider the two blocks as a system. The work done by external and internal forces are respectively
   (a) 0,0
   (c) 0,-20 J
   (b) 0,20 J
   (d) 20 J,-20 J
3. A shell explodes and many pieces fly off in different directions. Which of the following is conserved?
   (a) Kinetic energy
   (b) Momentum
   (c) Neither momentum nor KE
   (d) Momentum and KE
4. When the cord is burnt with a match releasing the spring the two masses fly apart with equal
   (a) kinetic energy (b) speed
   (c) momentum (d) acceleration
5. Which one is correct?
   (a) Both masses will have equal KE
   (b) Lighter block will have greater KE
   (e) Heavier block will have greater KE
   (d) None of above answers is correct
6. Which of the following energies is conserved for the system?
   (a) Kinetic energy (b) Potential energy
   (c) Mechanical energy (d) None of these
7. An engine pumps up 100 kg of water through a height of 10 m in 5 s. Given that the efficiency of the engine is 60%, what is the power of the engine? Take g = 10 ms^{-2}
   (a) 33 kW (b) 3.3 kW
   (c) 0.33 kW (d) 0.033 kW
8. A pump motor is used to deliver water at a certain rate from a given pipe. To obtain 'n' times water from the same pipe in the same time, by what amount the power of the motor should be increased?
   (a) times n^2 (b) n^3 times
   (c) n times (d) $n^{(3/2)}$ times
9. A If a long spring is stretched by 0.02m its potential energy is u . If spring is stretched by 0.1 m, then its potential energy will be
   (a) $\frac{U}{5}$ (b) U
   (c) 5U (d) 25 U
10. A body of mass. 10 kg at rest is acted upou simultaneously by two forces 4N and 3 N at right angles to each other The kinetic energy of the body at the end of 10 sec is
    (a) 100 J (b) 300J
    (c) 50J (d) 125J
11. A cylinder of mass 10 kg is sliding on a plane with an initia\ velocity of 10 m/s, If coefficient of friction between surface and cylinder is 0.5, then before stopping it will describe
    (a) 12.5 m (b) 5 m
    (c) 7.5 m (d)10 m
12. A spring of force constant 10 N/m has an initial stretch 0.20 m. In changing the stretch to 0.25 m, the increase in potential energy is about
    (a) 0.1 joule
    (b) 0.2 joule
    (c) 0.3 joule
    (d) 0.5 joule
13. From a waterfall, water is falling down at the rate of 100 kg/s on the blades of turbine. If the height of the fall is 100 m, then the power delivered to the turbine is approximately equal to
    (a) 100 kW

(b) 10 kW
(c) 1kW
(d) 1000 W

14. A man is riding on a cycle with velocity 7.2 km/hr up a hill having a slope 1 in 20. The total mass of the man and cycle is 100 kg. The power of the man is
(a) 200 W (b) 175 W
(c) 125 W (d) 98 W
15. A 10 HP motor pumps out water from a well of depth 20 m and fills a water tank of volume 22380 litres at a height of 10 m from the ground. the running time of the motor to fill the empty water tank is (g = 10 ms^{-2})
(a) 5 minutes (b) 10 minutes
(c) 15 minutes (d) 20 minutes

CHEMISTRY

1. Consider the following reaction at 600°C.
$2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$;Kc = 4.00
A mixture was prepared with $[SO_3]$ = 0.50 M, $[O_2]$ = 0.35 M and $[SO_2]$=0.0M
Thus, equilibrium concentration of O_2 is
(a) 0.0450M (b) 0.035M
(c) 0.35M (d) 0.45M
2. For which of the following reactions does the equilibrium constant depends on the unit of concentration?
(a) $CO_{(g)}+H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$
(b) $NO_{(g)} \rightleftharpoons 1/2\ N_{2(g)} + 1/2\ O_{2(g)}$
(c) $COCl_{2(g)} \rightleftharpoons CO(g) + Cl_{2(g)}$
(d) None as Kc is unitless
3. For the reaction in equilibrium.
$A \rightleftharpoons B$
$\frac{[B]}{[A]} = 4.0 \times 10^8$, $-\frac{d[A]}{dt} = 2.3\times 10^6\ S^{-1}[A]$
$-\frac{d[B]}{dt} = K[B]$ thus , K is
(a) $1.1\times 10^{-15} S^{-1}$ (b) $9.2 \times 10^{14} S^{-1}$
(c) $1.7\times 10^{2} S^{-1}$ (d) $5.8\times 10^{3} S^{-1}$
4. For the equilibrium $N_2O_4(g) \rightleftharpoons 2NO_{2(g)}$, the equilibrium constant Kp = 0.112 at 298 K. If the partial pressure of NO_2 in the equilibrium mixture is 0.40 atm, the partial pressure of N_2O_4 would be
(a) 0.28 atm (b) 0.56 atm
(c) 2.8 atm (d) 1.43 atm
5. The value of K_C for the reaction, $COCl_{2(g)} \rightleftharpoons CO(g) + Cl_{2(g)}$ is 2.5×10^{-10} at 300 K. Starting with pure $COCl_{2(g)}$ in a closed vessel, if the concentration of $CO_{(g)}$ is 1×10^{-5} M at equilibrium, the concentration of $COCl_{2(g)}$ at equilibrium would be
(a) 2.5 M (b) 2.5×10^{5} M
(c) 2.5×10^{-5} M (d) 0.4 M
6. The concentration of the oxides of nitrogen are monitored in air – pollution reports . At 25℃, the equilibrium constant for the reaction
$NO(g) + \frac{1}{2} O_{2(g)} \rightleftharpoons NO_{2(g)}$ is 1.3×10^6 *and that for*
$\frac{1}{2} N_2(g) + \frac{1}{2} O_{2(g)} \rightleftharpoons NO_{(g)}$
is 6.5×10^{-1} (when each species is expressed in terms of partial pressure). For the reaction, $N_{2(g)} + 2O_{2(g)} \rightleftharpoons 2NO_{2(g)}$ The equilibrium constant is
(a) 7.14×10^{-19} (b) 8.45×10^{-10}
(c) 2.91×10^{-5} (d) 5.0×10^{-22}
7. $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is a gaseous phase equilibrium reaction taking place at 400K in a 5L flask . For this
(a) $K_c = K_x$ *(b)* $K_c = 25K_x$
(c) $K_x = 25K_c$ *(d)* $Kc = 5K_x$
8. Given the equilibrium constant values:
(i) $N_2(g) + \frac{1}{2} O_{2(g)} \rightleftharpoons N_2O_{(g)}$ Kc = 2.7×10^{-18}
(ii) $N_2O_4(g) \rightleftharpoons 2NO_{2(g)}$; Kc = 4.6×10^{-3}
(iii) $\frac{1}{2} N_{2(g)} + O_{2(g)} \rightleftharpoons NO_{2(g)}$; Kc = 4.1×10^{-9}
Thus , for the reaction ,$2N_2O(g) + 3O_2 \rightleftharpoons 2N_2O_{4(g)}$,
Kc is
(a) 5.46×10^{7} (b) 5.46×10^{-7}
(c) 1.832×10^{6} (d) 1.832×10^{-6}
9. The equilibrium constant for the reaction; $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$ is 4×10^{-4} at 200K. In the presence of a catalyst the equilibrium is attained 10 times faster.Therefore the equilibrium constant in presence of catalyst at 200 K is
(a) 4×10^{-3} (b) 4×10^{-4}
(c) 4×10^{-5} (d)None of these
10. For the reaction in equilibrium,
(i) $CO(g) + \frac{1}{2} O_2(g) \rightleftharpoons CO_2(g)$
(

Equilibrium Constant	Free energy change
) K_1	ΔG_1
K_2	ΔG_2

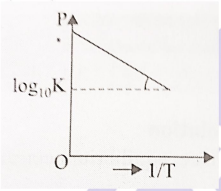
$2CO(g) + O_2(g) \rightleftharpoons 2CO_2(g)$

(a) $K_1 = 2K_2$, $\Delta G_1 = 2\Delta G_2$
(b) $K_2 = 2K_1$, $\Delta G_2 = 2\Delta G_1$
(c) $K_2 = 2K_1^2$, $\Delta G_2 = 2\Delta G_1$
(d) $K_2 = K_1^2$, $\Delta G_2 = 2\Delta G_1^2$

11. Variation of equilibrium constant K with temperature , T is given by Van,t hoff equation

$\text{Log}_{10}K = \log A - \frac{\Delta H^\circ}{2.303\,RT}$

Graphically it is shown as given θ= tan (0.5) and OP=10 thus



(a) pre-exponential factor is 10

(b) pre-exponential factor is 10^{10}

(c) heat of reaction is 2853 J mol^{-1} at 298 K

(d) heat of reaction is 9.574 J mol^{-} at 298 K

12. Kp for the equilibrium $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ is 0.141 at 25°C and 1 bar. This reaction is spontaneous at 25°C and partial pressure of

	(NO_2)	(N_2O_4)
(a)	1bar	1 bar
(b)	10 bar	1 bar
(c)	1bar	10 bar
(d)	2bar	1 bar

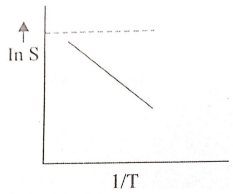
13. For the equilibrium,$PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$ Equilibrium constant is Keq = 100 and free energy change is ΔG°= -20.0 kJ at a given temper ature.

$\frac{1}{2}PCl_3\,(g) + \frac{1}{2}Cl_{2(g)} \rightarrow \frac{1}{2}PCl_{5(g)}$

Thus for the equilibrium constant (Keq) and free energy change(ΔG°),

	K'eq	ΔG°
(a)	0.01	-10.0
(b)	0.10	-10.0
(c)	0.10	+10.0
(d)	0.01	+10.0

14. The solubility (S) of a solute in water varies with temperature as follows:
$S = Ae^{-\Delta H/RT}$ For which of the following solute In S vs 1/T plot is When ΔH represent enthalpy of solution?



(a) CaO
(b) $CuSO_4$
(c) $MgSO_4$
(d) $CuSO_4\,5H_2O$

15. On taking 60.0g CH_3COOH and 46.0g CH_3CH_2OH in a 5L flask in the presence of H_3O^+ (catalyst) ,at 298 K 44.0 g of $CH_3COOC_2H_5$ is formed at equilibrium. If amountof CH_3COOH is doubled with affectin amount of $CH_3COOOC_2H_5$ formed

a) 20.33g (b) 58.66 g
(c) 44.0 g (d) 22.0 g

MATHS

1. A round table conference is to be held between 20 delegates of 20 countries. In how many ways can they be seated if two particular delegates are (a) always to sit together
(a) 2× 18! (b) 2× 8!
(c) 2× 28! (d) 2× 38!
2. In how many ways can mn letters be posted in n letter-boxes?
(a) $(mn)^n$
(b) $m^{m\,n}$
(c) $n^{(mn)}$
(d) None of these
3. Four dice (six faced) are rolled. The number of possible outcomes in which at least one die shows 2 is
(a) 1296
(b) 625
(c) 671
(d) None of these
4. There are three girls in a class of 10 students. The number of different ways in which they can be seated in a row such that no two of the three girls are together is
(a) $7! \times {}^6P_3$
(b) $7! \times {}^8P_3$
(c) 7! ×3!
(d) $\frac{10!}{3!7!}$
5. The number of ways in which any four letters can be selected from the word 'CORGOO' is be
(a) 15

(b) 11
(c) 7
(d) None of these

6. The number of 4 digit even numbers that can be formed using 0, 1, 2, 3, 4, 5, 6 without repetition is
   (a) 120 (b) 300
   (c) 420 (d) 20
7. If ${}^{n}C_{12} = {}^{n}C_{6}$, then ${}^{n}C_{2}$ =
   (a) 72
   (b) 153
   (c) 306
   (d) 2556
8. If ${}^{n}P_{r} = 30240$ and ${}^{n}C_{r} = 252$, then the ordered pair (n, r) is equal to
   (a) (12,6)
   (b) (10, 5)
   (c) (9,4)
   (d) (16,7)
9. ${}^{15}P_{8} = A + 8 \cdot {}^{14}P_{7} \Longrightarrow A =$
   (a) ${}^{14}P_{6}$
   (b) ${}^{14}P_{8}$
   (c) ${}^{15}P_{7}$
   (d) ${}^{16}P_{9}$
10. The number of four digit numbers formed by using the digits 0, 2, 4, 5 and which are not divisible by 5, is
    (a) 10
    (b) 8
    (c) 6
    (d) 4
11. How many words can be formed with the letters of the word MATHEMATIC'S by rearranging them?
12. Find the number of ways in which 5 girls and 5 boys can be arranged in a row if boys and girls are alternately placed
13. Find the number of arrangements of the letters of the word SALOON, if the two O's do not come together
14. Find number of positive integers which can be formed by using any number of digits from 0, 1, 2, 3, 4, 5 but using each digit not more than once in each number. How many of these integers are greater than 3000? What will happen if repetition is allowed?
15. Find the number of words with or without meaning which can be made using all the letters of the word AGAIN. If these words are written as in a dictionary, what will be the 50th word?