TEST SERIES NET Dec. 2018

PAPER CODE 03 BOOKLET CODE A

Time 3 Hour **M.M. 150**

Chemical Science Date 14/11/2018

Read The Following Instructions Carefully

1. **This test booklet contains 50 (25 part B + 25 part C) multiple choice question (MCQs).**
2. **All question is compulsory**
3. **Each question in B carries 2 marks and part C question carry 4 marks each respectively**
4. **Read the question carefully and mark your appropriate response to the OMR sheet.**
5. **There is negative marking of 1/4 for each wrong answer**
6. **Mark the response by Black Ball pen only.**
7. **Any other belongings like book/ Notes / Electronic device etc are not permitted in the examination hall.**
8. **Submit your answer sheet (OMR sheet) to the invigilator before leaving the examination hall and carry the question paper booklet after completion of exam.**

ALCHEMIST SCIENCE ACADEMY

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Part B

Q1. Indicate which of the following function are acceptable wave function?

1. $\psi = x$ 2. $\psi = x^2$ 3. $\psi = \sin x$ 4. $\psi = e^{-x^2}$

Q2. Assume that a particle of mass m is confined to a cubic box and its energy is $\frac{101h^2}{8\,ma^2}$ what is the degeneracy of this level.

1. 24 2. 22 3. 23 4. 28

Q3. According to virialtheorem, for S.H.O and hydrogen atom respectively.

1. $\langle T\rangle = \langle V\rangle, \langle T\rangle = \frac{-1}{2}\langle E\rangle$ 2. $\langle T\rangle = \langle E\rangle, \langle T\rangle = \frac{-1}{2}\langle V\rangle$

3. $\langle T\rangle = \langle V\rangle, \langle T\rangle = \frac{-1}{2}\langle V\rangle$ 4. $\langle T\rangle = \langle E\rangle, \langle T\rangle = \langle E\rangle$

Q4. Match the following, degeneracy of the respect given system

(i) Third energy level of a particle in one-dimensional box	(a) 1
(ii) Rigid diatomic rotar in the third rotational energy level	(b) 5
(iii) hydrogen atom third energy state	(c) 9
(iv) hydrogen atom third exited state	(d) 16

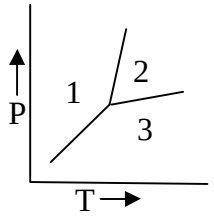
1. (i)- a ,(ii)- b(iii)- c ,(iv)- d 2. (i)- d ,(ii)- b , (iii) - C , (iv) - a

3. (i)- c ,(ii)- d(iii)- b ,(iv)- a 4. None

Q5. Show the ground state symbol of H_2 is

1. ${}^1\sum_g^+$ 2. ${}^1f_g^+$ 3. ${}^{-1}\sum_g^+$ 4. ${}^{+1}\sum_g^-$

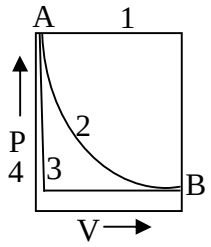
Q6.



Phasediagram of a one – component system which is correct for the relative magnitates of the specific entropies.

1. $S_2 > S_1 > S_3$ 2. $S_3 > S_2 > S_1$ 3. $S_1 = S_2 > S_3$ 4. $S_1 > S_2 > S_3$

Q7. The state of 2 mole of an ideal gas is changed from the point A to that point B along three different path, as shows in the following $P-V$ diagram if the change of entropy of the gas is changing its state from state A to stable B along the path i is denoted ΔSi, then which of the which of the following statements is correct.



1. $\Delta S_1 > \Delta S_2 > \Delta S_3 > \Delta S_4$ 2. $\Delta S_1 < \Delta S_2 < \Delta S_3 < \Delta S_4$

3. $\Delta S_1 = \Delta S_2 = \Delta S_3 = \Delta S_4$ 4. $\Delta S_1 \neq \Delta S_2 \neq \Delta S_3 \neq \Delta S_4$

Q8. If the ratio of composition of oxidized and reduced species in electrochemical cell is given as $\frac{[O]}{[R]} = e^{-3}$, the Correct potential difference will be.

1. $E - E^0 = \frac{-3RT}{nF}$ 2. $E^0 - E = \frac{-3RT}{nF}$ 3. $E - E^0 = \frac{RT}{nF}$ 4. $E^0 - E = \frac{-3RT}{F}$

Q9. The correct ΔG for the cell reaction involving steps $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$

$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

1. $\Delta G^0 - RT\ln\frac{a_{zn^{2+}}}{a_{Cu^{2+}}}$ 2. $\Delta G^0 + RT\ln\frac{a_{zn^{2+}}}{a_{Cu(s)}}$ 3. $\Delta G^0 - RT\ln\frac{a_{zn(s)}}{a_{Cu^{2+}}}$ 4. $\Delta G^0 + RT\ln\frac{a_{zn^{2+}}}{a_{Cu^{2+}}}$

Q10. Which of the following molecules will not shows a vibrational Raman spectrum.

1. H_2 2. HCl 3. CO 4. None

Q11. Choose the correct option

1. $\left(\frac{\partial P}{\partial T}\right)_v = \frac{a}{b}$ 2. $\left(\frac{\partial P}{\partial V}\right)_T = \frac{a}{b}$ 3. $\left(\frac{\partial P}{\partial H}\right)_T = \frac{a}{b}$ 4. $\left(\frac{\partial P}{\partial T}\right)_V = \frac{b}{a}$

Q12. Calculate the final volume of one mole of an ideal gas initially at 0^0C and 1atm pressure if it absorb 1000 Cal of heat during a reversible isothermal expansion.

1. $121.25dm^3$ 2. $230dm^3$ 3. $40dm^3$ 4. $20dm^3$

Q13. The van der waals constant a and b for hydrogen are $0.246 dm^6\ atm\ mol^{-2}$ and $2.67\times10^{-2} dm^3\ mol^{-1}$, respectively. Calculate the inversion temperature of hydrogen

1. $T_i = -48.28^0 C$ 2. $T_i = -48.28^0 k$ 3. $T_i = +48.28^0 k$ 4. $T_i = 0$ k

Q14. For the dissociation reaction $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ derive the expression for the degree of dissociation in terms of K_p and total pressure P.

1. $\propto = \dfrac{1}{\sqrt{2+\dfrac{4p}{k_p}}}$ 2. $\propto = \dfrac{1}{\sqrt{k_p+2p}}$ 3. $\propto = \sqrt{\dfrac{k_p}{k_p+4p}}$ 4. None

Q15. Calculate the mass ionic molality of K_2SO_4 which having molaity (m)

1. 4m 2. 2m 3. $(4m)^{-1/3}$ 4. $\sqrt[3]{4m}$

Q16. The molar ionic conductance at infinite dilution of silver ions is $61.92\times10^{-4} Sm^2 mol^{-1}$ at $25^0 C$ Calculate the ionic mobility of silver ions at $25^0 C$ infinite dilution.

1. $64\times10^{-8} m^2 V^{-1} S^{-1}$ 2. $6.417\times10^{-8} m^2 V^{-1} S^{-1}$ 3. $10^8 m^2 V^{-1} S^{-1}$ 4. $10^8 m^2 V^{-1} S^{-1}$

Q17. The resistance of $0.01M$ solution of an electrolyte be was found to be 210Ω at $25^0 C$. Calculate the molar conductance of the solution at $25^0 C$ cell constant $= 0.88 cm^{-1}$

1. $0.0419 Sm^2 mol^{-1}$ 2. $4.19 Sm^2 mol^{-1}$ 3. $41.9 Sm^2 mol^{-1}$ 4. $4\times10^{-2} Sm^2 mol^{-1}$

Q18. For the Daniel cell involving the cell reaction $Zn(S) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(S)$

The standard free energies of formation of $Zn(s), Cu(s) Cu^{2+}(aq)$ and $Zn^{2+}(aq)$ are $0, 0$ $64.4k Jmol^{-1}$ and $-154.0 kJmol^{-1}$ respectively. Calculate the standard EME of the cell.

1. 1.13V 2. 2.13V 3. 0.013V 4. 3.4V

Q19. The standard EME of the Daniell cell involving the cell reaction

$Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(s)$ is 1.10 volts calculate the equilibrium constant of the cell reaction at $25^0 C$

1. 1.585×10^{37} 2. 1585×10^{30} 3. 1.685×10^{31} 4. 15.85×10^{37}

Q20. Calculate the liquid Junction potential at $25^0 C$ b/w two solution of HCl having mean ionic activities of 0.01 and 0.001 respectively. The transference number of H^+ ion (t_+) in HCl may be taken as 0.83.

1. 0.0039V 2. 3.9V 3. 0.039V 4. None

Q21. Find out the point group in IOF_3 and $W\left[N\left(CH_3\right)_2\right]_6$ is respectively.

1. C_3V, O_h 2. C_s, T_h 3. C_3, T_h 4. C_1, O_h

Q22. Find out the incorrect options

1. Point group of twisted Confermation of ethylene is D_2

2. If any molecule have S_n operation Called optically inactive compound

3. $1,3,5,7$ tetrafluorocyclooctatraene has D_4 point group

4. Point Group of 9-BBN is C_{2V}

Q23. Find out the point group of $\left[CH_3\left(H_2\right)\right]^+$ in its ground electronic state

1. C_s 2. C_{2V} 3. C_3 4. D_{3h}

Q24. From the Eadie – hofstee method, the correct expression for slope

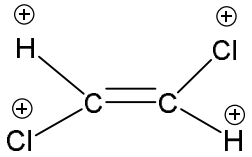
1. $-\frac{1}{k_m}$ 2. $\frac{1}{k_m}$ 3. $\frac{1}{V_m}$ 4. $\frac{K_m}{V_m}$

Q25. Unit of rate constant , when the order of the reaction is $\frac{5}{2}$

1. $\left(dm^3\right)^{3/2} mol^{-3/2}s^{-1}$ 2. $\left(dm^{-3}\right)^{3/2} mol^{3/2}s^{-2}$ 3. $dm^3mol^{-3/2}s^{-1}$ 4. $dm^3mol^{3/2}s^{-2}$

Part C

Q26. Out of plane bending mode of trans – dichloro ethylene is given below

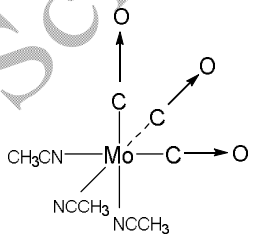


Belong to which one of the following representation is

1. A_g 2. A_u 3. E_g 4. None

Q27. Determine the number of IR – active modes for fac-$Mo(Co)_3CN(CH_3)_3$ as shows in the diagram.

C_{3v}	E	$2C_3$	$3s_v$		
A_1	1	1	1	z	$(x, y)(R_x, R_y)$
A_2	1	1	-1	R_z	
E	2	-1	0	$(x, y)(R_x, R_y)$	$(x^2 - y^2, xy)(xz, yz)$



1. A_1 2. E 3. A_2 4. 1 and 2 both

Q28. Nitrous oxide N_2O decomposes into N_2 and O_2 the reactants and product being all gaseous. If the reaction is first order Calculate the rate expression, in terms of initial pressure and total pressure

1. $t = \frac{1}{k}\ln\frac{P_i}{2P - 3P_i}$ 2. $t = \frac{1}{k}\ln\frac{P_i}{3P_i - 2P}$ 3. $t = \frac{1}{k}\ln\frac{2P_i}{3P_i - 2P}$ 4. $t = \frac{1}{k}\ln\frac{P_i}{2P + 3P_i}$

Q29. In a first order reaction, it takes the reactant 40.5 minutes to be 25% decomposed. Calculated the rate constant of the reaction

1. $7.11\times10^{-3}\,\text{min}^{-1}$ 2. $0.71\times10^{-3}\,\text{min}^{-1}$ 3. $10^{-4}\,\text{min}^{-1}$ 4. None

Q30. The following mechanism has been suggested for the reaction

$2NO + Br_2 \rightarrow 2NOBr$

(i) $NO + Br_2 \rightarrow NOBr_2$ (first) (ii) $NOBr_2 + NO \rightarrow 2NOBr$ (slow)

Determine the rate low

1. $k[NO]^2[Br_2]$ 2. $k[NO]^3[Br_2]$ 3. $k[NO]^{1/2}[Br_2]$ 4. None

Q31. A sample of gaseous HI was irradiated by light of wav length $253.7nm$ when $307J$ of energy was found to decompose 1.30×10^{-3} mole of HI. Calculate the quantum yield for the dissociation of HI

1. 1 2. 3 3. 4 4. 2

Q32. Iron (II) oxide, FeO crystal has a cubic structure and each edge of the unit cell is $5.0A^0$. Taking density of the oxide as $4gcm^{-3}$. Calculate the number of Fe^{2+} and O^{2-} ions present in each unit cell

1. $4,4$ 2. $4,2$ 3. $4,3$ 4. $2,2$

Q33. The miller indices of a crystal plane which cut through crystal axes at $(2a,-3b,-3c)$

1. $3\,\bar{2}\,\bar{2}$ 2. $2\,\bar{3}\,\bar{3}$ 3. $2\,\bar{1}\,\bar{3}$ 4. $2\,\bar{1}\,\bar{1}$

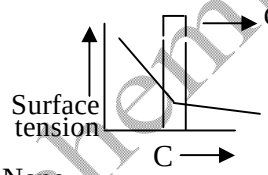
Q34. X-ray diffraction pattern found peak in B.C.C

1. 3k 2. 11k 3. 2k 4. All of the above

Q35. Select the correct statements

1. The maximum concentration of an electrolyte required to cause coagulation is called gold number.

2. The efficiency of an ion to cause coagulation depend upon it density

3. 

4. None

Q36. Calculate how long a hydrogen atom will remain on the surface of a solid at $1000K$ if its desorption activation energy is $E_1 = 15KJmol^{-1}$, $t_0 = 10^{-13}s$

1. $10^{-31}e^{1.81}s$ 2. $10^{-13}e^{18.1}s$ 3. $10e^{-1.81}s$ 4. $e^{-1.81}s$

Q37. For the diatomic gas, according to Langmuir adsorption isotherm, the pressure of the gas

1. $\frac{1}{k}\left(\frac{q}{1+q}\right)^{1/2}$ 2. $\frac{1}{\sqrt{k}}\left(\frac{q}{1+q}\right)^{1/2}$ 3. $\frac{1}{k}\left(\frac{q}{1-q}\right)^{1/2}$ 4. None

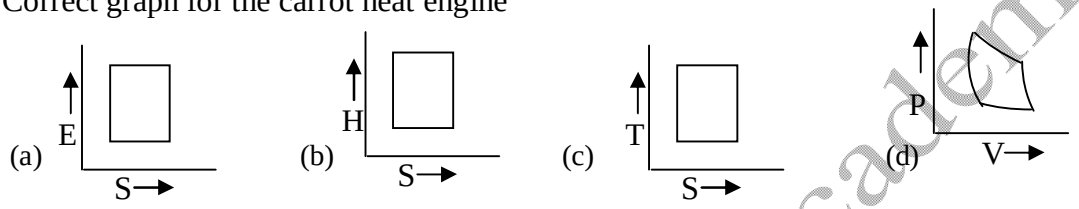
Q38. Equal masses of polymer molecules with $M_1 = 10,000$ and $M_2 = 10^5$ are missed. Calculate $\bar{M}m$ (Given $m_1 = m_2 = 2\times10^5$)

1. 55000 2. 52000 3. 53000 4. 54000

Q39. The free energy change (ΔG) accompanying a given process is $-85.77KJ$ at 25^0C and $-83.68KJ$ at 35^0C. Calculate the change in enthalpy ΔH for the process at 30^0C.

1. $+148.05KJ$ 2. $-148.05KJ$ 3. 0 4. None

Q40. Correct graph for the carrot heat engine



1. $(a),(b),(c)$ 2. $(a),(b),(d)$ 3. All of the above (d) none

Q41. According to Joules thompson effect the correct option is

1. heating of gas occur's depend upon the amount of gas.
2. Temperature change of the gas depend upon the initial temperature of the gas
3. Joules thompson coefficient is $+$ve for cooling of an ideal gas
4. None

Q42. A Quantum mechanical contains 6 Energy level distributed over 17 energy state, If ground state degeneracy is 1. Find out the partition function at $0k$ and ∞k will be

	0.k	∞.k
1.	1	6
2.	6	1
3.	17	1
4.	1	17

Q43. Find incorrect option of partition function

1. $q_{rot.} = \dfrac{KT}{BhC}$
2. $q_{vib.} = \dfrac{1}{1\text{-}e^{-\frac{hv}{KT}}}$ (if $Z.P.E. = 0$)
3. $q_{tr.} = \dfrac{(2\pi mKT)^{3/2}}{h^3}\times V$
4. $q_{ele.} = 1\,(\text{if } E_2 >>> E_0)$

Q44. The ratio of translational partition function of D_2 and H_2 at constant temperature and volume.

1. $2\sqrt{2}:1$ 2. $\dfrac{2}{\sqrt{2}}$ 3. $\sqrt{2}/2$ 4. $1/\sqrt{2}$

Q45. In mixture A and B, components shows $-ve$ deviations as:

1. ΔV_{mix} is $+ve$
2. $A-B$ interaction is weaker than $A-A$ and $B-B$ interaction
3. ΔH_{mix} is $+ve$
4. $A-B$ interaction is stronger than $A-A$ and $B-B$ interaction

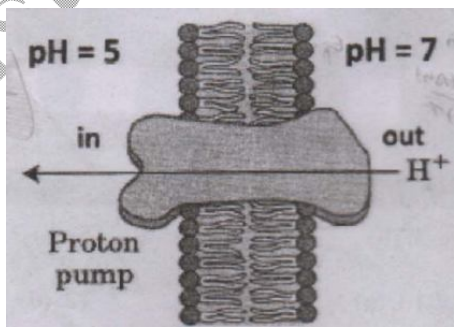
Q46. If liquid A and B from ideal solution, than:

1. $\Delta G_{mix}=0$ 2. $\Delta H_{mixing}=0$ 3. $\Delta G_{mix}=0, \Delta S_{mix}=0$ 4. $\Delta S_{mix}=0$

Q47. For an ideal gas in a closed system at constant temperature T, what are the values of $\frac{\partial U}{\partial V}$ and $\frac{\partial H}{\partial p}$.

1. $\frac{\partial U}{\partial V}=0$ and $\frac{\partial H}{\partial p}=0$
2. $\frac{\partial U}{\partial V}>0$ and $\frac{\partial H}{\partial p}<0$
3. $\frac{\partial U}{\partial V}<0$ and $\frac{\partial H}{\partial p}>0$
4. $\frac{\partial U}{\partial V}>0$ and $\frac{\partial H}{\partial p}>0$

Q48. Proton pumps are ubiquitous in living organism. They (shown in figure below) serve as an important of pH gradient across momebrances, which lead to ATP synthesis. Calculate the amount of CHEMICAL worked one at temperature T by such a pump to maintain $pH=5$ inside the cellular compartment against a neutral pH outside the membrane?



1. 2RT 2. 2.303RT 3. 4.606RT 4. 23.3RT

Q49. For a sparingly soluble salt A_pB_q, the relationship of its solubility product (L_s) with its solubility (S) is

1. $L_S = S^{p+q}.p^p.q^q$ 2. $L_S = S^{p+q}.p^q.q^p$ 3. $L_S = S^{pq}.p^p.q^q$ 4. $L_S = S^{pq}.(p.q)^{(p+q)}$

Q50. Consider a particle in a one dimensional box of length ‘a’ with the following potential

$V(x) = \infty \qquad x < 0$

$V(x) = \infty \qquad x > a$

$V(x) = 0 \qquad 0 \le x \le a/2$

$V(x) = V_1 \qquad a/2 \le x \le a$

Starting with the standard particle in a box Hamiltonian as the Hamiltonian and potential of V_1 form $'a/2'$ to ‘a’ as perturbation, the first-order energy correction to the ground state is

1. V_1 2. $V_1/4$ 3. $-V_1$ 4. $V_1/2$

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Test Series Schedule NET Dec. 2018

Inorganic Chemistry	10/11/2018	17/11/2018	24/11/2018
Organic Chemistry	12/11/2018	19/11/2018	26/11/2018
Physical Chemistry	14/11/2018	21/11/2018	28/11/2018

Full Length Test

01/12/2018	5/12/2018	10/12/2018

Time 02:00 PM to 05:00 PM

Answer Key

1.(4,3)	2.(1)	3.(3)	4.(1)	5.(1)	6.(2)	7.(3)
8.(1)	9.(4)	10.(4)	11.(1)	12.(1)	13.(1)	14.(3)
15.(4)	16.(2)	17.(1)	18.(1)	19.(1)	20.(1)	21.(2)
22.(3)	23.(1)	24.(1)	25.(1)	26.(2)	27.(4)	28.(2)
29.(1)	30.(4)	31.(4)	32.(1)	33.(1)	34.(3)	35.(3)
36.(2)	37.(4)	38.(1)	39.(2)	40.(3)	41.(2)	42.(4)
43.(3)	44.(1)	45.(4)	46.(2)	47.(1)	48.(3)	49. (1)
50. (4)						