UGC POINT

LEADING INSTITUE FOR CSIR-JRF/NET,GATE & JAM

BOOKLET CODE
A

SUBJECT CODE
01

CHEMICAL SCIENCE

TEST SEREIS # 3

PHYSICAL CHEMISTRY

Date: 27/5/2015
Maximum Marks: 170

Timing: 2:00 H

Instructions

1. This test paper has a total of 60 questions carrying 170 marks. The entire question paper is divided in two sections, A and B. All sections are compulsory. Question in each section are different type.
2. **Part-A**. This section has 35 Questions of 2 Marks carries a total of 70 marks.
3. **Part-B.** This section has 25 Questions of 4 Marks carries a total of 100 marks
4. Read the Questions 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** or **Blue** 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

1. What is false about ice?
   (1) Ice is less dense than water
   (2) Ice is H-bonded solid
   (3) Ice has wurtizite structure
   (4) Ice has tetrahedral zinc blende structure

2. The second order Bragg diffraction from the 100 planes of a cubic crystal is equivalent to
   (1) The second order diffraction from the 200 planes
   (2) Ist order diffraction from the 200 planes
   (3) Ist order diffraction from the 400 planes
   (4) First order diffraction from the 100 planes

3. An element crystallizes both in FCC and BCC lattice. If the density of the element in the two forms is the same, the ratio of unit cell length of FCC to that of BCC lattice is :
   (1) $(2)^{1/3}$ (2) $\left(\frac{1}{2}\right)^{1/3}$ (3) $(4)^{1/3}$ (4) $\left(\frac{1}{4}\right)^{1/3}$

4. You have face-centered cubic lattice in which the corner atoms are type A & face atom of the type B. what is the formula of the compound in terms of A & B?
   (1) AB (2) AB_2
   (3) AB_3 (4) AB_4

5. In a closed vessel of volume V, a mole of nitrogen & b moles of oxygen are made to react to give nitric oxide, according to the reaction
   $$N_2 + O_2 \rightleftharpoons 2NO$$
   If at equilibrium 2x moles of NO are obtained then
   (1) $K_C = \frac{x^2}{(a-x)(b-x)} \times V$ (2) $K_C = \frac{4x^2}{(a-x)(b-x)} \times V$
   (3) $K_C = \frac{4x^2}{V(a-x)(b-x)}$ (4) $K_C = \frac{4x^2}{(a-x)(b-x)}$

6. Given the reactions
   $CuO(s) + H_2(g) \rightleftharpoons Cu(s) + H_2O(g);\ K_C = 2 \times 10^{15}$
   $H_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons H_2O(g);\ K_C = 5 \times 10^{22}$
   K_C for the reaction
   $CuO(s) \rightleftharpoons Cu(s) + \frac{1}{2}O_2(g)$ is

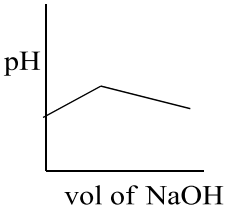
(1) $\frac{K_{C[1]}}{K_{C[2]}}$ (2) $\frac{2\times10^{15}}{5\times10^{22}}$ (3) 4×10^{-8} (4) All of these

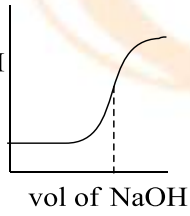
7. Which of the following statement is true of the reaction, $2NO_2(g) \rightleftharpoons 2NO(g)+O_2(g)$. Which occurs when NO_2 is heated
   (1) Each mole of NO_2 that dissociates produces 2 moles of NO & one mole of O_2
   (2) If two moles of NO_2 are allowed the reach equilibrium, two moles of NO, one mole of O_2 will be produced
   (3) For every two molecules of NO_2 originally present there will be at equilibrium two molecules of NO & one molecule of O_2
   (4) If one mole of NO_2 is heated in a closed container, there will be present at equilibrium more than one mole of gas

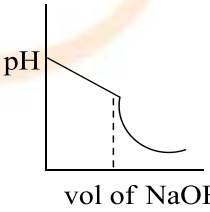
8. Which oxide of nitrogen is most stable at 273 K
   (1) $2N_2O_5 \rightleftharpoons 2N_2+5O_2 \;\; K_C=1\times10^{34}$ (2) $2N_2O \rightleftharpoons 2N_2+O_2 \;\; K_C=1\times10^{32}$
   (3) $2NO \rightleftharpoons N_2+O_2 \;\; K_C=1\times10^{32}$ (4) $2NO_2 \rightleftharpoons N_2+2O_2 \;\; K_C=1\times10^{31}$

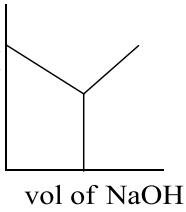
9. The addition of CH_3COONa crystal to one litre of 0.1 M acetic acid will produce an
   (1) Increase in the value of K_a
   (2) Decrease in the value of K_a
   (3) Increase in the *pH*- value
   (4) Increase in Na^+ ion concentration

10. Which one of the following curves represent the graph of pH during the titration of NaOH & HCl

(1) 

(2) 

(3) 

(4) 

11. A certain buffer contains equal concentration of X^- & HX. The K_b of X^- is 10^{-10} the *pH* of the buffer is
   (1) 4 (2) 7 (3) 10 (4) 14

12. How many moles of electrons mast flow through the voltmeter to deposit 1.9 7 gram of Au^0 (*At. Wt. of Au* = 197)
   (1) 1×10^{-2} (2) 2×10^{-2} (3) 3×10^{-2} (4) 3×10^{-1}

13. The electrolysis of an aqueous solution *NaCl* will proton

(1) $NaOH, HCl, O_2$ (2) $NaOH, H_2, Cl_2$

(3) Na, Cl_2 (4) $NaOH, O_2, Cl_2$

14. For a potentiometric titration , in the curve of *EMF v/s* value of (V) of the titrate added, the equivalence point

(1) $\left|\frac{\partial E}{\partial V}\right| = 0, \left|\frac{\partial^2 E}{\partial V^2}\right| = 0$ (2) $\left|\frac{\partial E}{\partial V}\right| = 0, \left|\frac{\partial^2 E}{\partial V^2}\right| > 0$

(3) $\left|\frac{\partial E}{\partial V}\right| > 0, \left|\frac{\partial^2 E}{\partial V^2}\right| = 0$ (4) $\left|\frac{\partial E}{\partial V}\right| > 0, \left|\frac{\partial^2 E}{\partial V^2}\right| > 0$

15. The correct Nernst equation for the concentration cell

$Pt \,|\, H_2(p) \,|\, HCl(a\pm 1)_1 \,|\, AgCl(s) \,|\, Ag \,\|\, Ag \,|\, AgCl(s) \,|\, HCl(a\pm)_2 \, H_2(p) \,|\, Pt$

Without liquid junction potential would be

(3) $E = \frac{2RT}{F} \ln \frac{(a\pm)_1}{(a\pm)_2}$ (2) $E = \frac{RT}{F} \ln \frac{(a\pm)_2}{(a\pm)_1}$

(3) $E = \frac{2RT}{F} \ln \frac{(a\pm)_2}{(a\pm)_1}$ (4) $E = \frac{RT}{2F} \ln \frac{(a\pm)_2}{(a\pm)_1}$

16. When a triatomic as absorb as atoms on the surface of a solid the Langmuir absorption isothermal becomes

(1) $\theta = \frac{(Kp)^{1/\sqrt{3}}}{1+(Kp)^{1/\sqrt{3}}}$ (2) $\theta = \frac{(Kp)^{1/3}}{1+(Kp)^{1/3}}$

(3) $\theta = \frac{(Kp)^{1/3}}{1+Kp}$ (4) $\theta = \frac{Kp}{1+Kp}$

17. For *BET* equation if graph is plotted between $\frac{P}{V_{total}(P_o - P)}$ *vs* $\frac{P}{P_o}$ then slop will be

(1) $\frac{C-1}{V_{mono}}$ (2) $\frac{C-1}{V_{mono} \times C}$ (3) $\frac{C-1}{C}$ (4) $\frac{C-1}{V_{mono}^2}$

18. Number of one & two dimensional irreducible representations in the $E \times E$ direct product of CCl_4 are respectively

(1) 1, 2 (2) 2,1 (3) 1, 1 (4) 2, 2

19. D_{2d} point group contain 5 classes given that there is one 2 dimensional irreducible representation no of 1D irreducible representation are

(1) 1 (2) 2 (3) 3 (4) 4

20. Point group of *NOCl* is

(1) $C_{\infty v}$ (2) C_{2V} (3) C_s (4) none

21. What is *x*, *y* & *z* in the following table

Inverse	**b**	**a**
X	Even	Even
Y	odd	Even
Z	Odd	Odd

(1) $S_b^{b-a}, C_b^{b-a}, S_b^{2b-a}$ (2) $C_b^{b-a}, S_b^{b-a}, S_b^{2b-a}$

(3) $S_b^{2b-a}, C_b^{b-a}, S_b^{b-a}$ (4) None is correct

22. Number of operations w.r.t to S_n axis in tetrahedral point group are

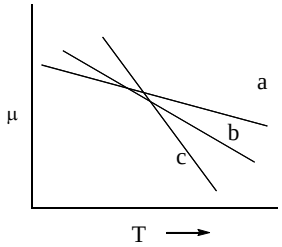
(1) 4 (2) 5 (3) 6 (4) 8

23. Which of the following thermodynamic relation is correct

(1) $\left(\frac{\delta G}{\delta P}\right)_{T,N} = V$ (2) $\left(\frac{\delta G}{\delta T}\right)_{P,N} = -S$

(3) $\left(\frac{\delta \mu i}{\delta T}\right)_{P,N} = -Si$ (4) All of above

24. Study the following graph S answer following question



(1) $S_b > S_C > S_a$ (2) $S_a > S_b > S_C$

(3) $S_C > S_b > S_a$ (4) None

25. The result of product of $C_2(Z) \times \sigma_{xy}$ is

(1) E (2) σ_{xy} (3) C_{2Z} (4) i

26. Which one is incorrect associated Legendre function $P_1^m(\cos\theta)$:-

(1) $P_3^2 = 15\sin^2\theta\cos\theta$ (2) $P_2^0 = \frac{1}{2}(3\cos^2\theta - 1)$

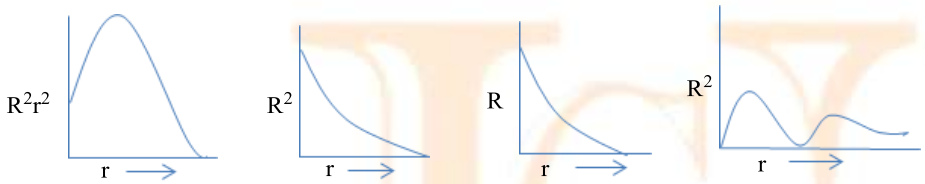
(3) $P_1^0 = \sin\theta$ (4) $P_2^2 = 3\sin^2\theta$

27. Correct spherical harmonics, $\Upsilon_1^m(\theta,\phi)$ for Li^{++} is:-

(1) $\Upsilon_2^{+2} \propto \sin\theta\cos\theta e^{+2i\phi}$ (2) $\Upsilon_2^{-2} \propto \sin^2\theta e^{-2i\phi}$

(3) $\Upsilon_2^{+1} \propto \sin\theta\cos\theta e^{-i\phi}$ (4) $\Upsilon_3^{-1} \propto (3\cos^3\theta - 3\cos\theta)e^{-i\phi}$

28. Which one is incorrect graph for 1s Atomic Orbital of H-atom



(1) (2) (3) (4)

29. What are the selection rules for a harmonic oscillator to show vibrational spectrum

(1) $\Delta v = 0, \pm 1$ (2) $\Delta v = \pm 1$ (3) $\Delta v = 0, \pm 1, \pm 2, \pm 3$ (4) $\Delta v = \pm 1, \pm 2, \pm 3$

30. The selection rules for the appearance of P-branch in the rotational vibrational absorption spectra of di-atomic molecule within rigid-rotor harmonic oscillator model is

(1) $\Delta v = \pm 1 \& \Delta J = \pm 1$ (2) $\Delta v = \pm 1, \& \Delta J = +1$

(3) $\Delta v = \pm 1 \& \Delta J = -1$ (4) $\Delta v = -1 \& \Delta J = -1$

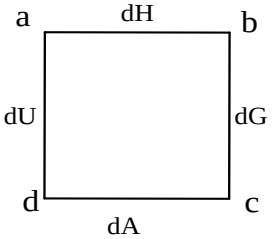
31. Enthalpy change for one mole of ideal gas that expand reversibly & isothermally from 1L to 10L at 400K is

(1) $-10.2KJ$ (2) $-5.1KJ$ (3) $-2.5KJ$ (4) 0

32. For 100% efficient engine which one of the following statement is correct

(1) Temperature of sink is at 0^oC
(2) Temperature of sink is at 0^oK
(3) Temperature of sink is less than source
(4) Temperature of sink is more than source

33. For thermodynamic square, corners a, b, c, d can be represented respectively by



(1) $VdP, TdS, -PdV, -SdT$ (2) $-PdV, TdS, VdP, -SdT$

(3) $TdS, VdP, -SdT, -PdV$ (4) $-SdT, -PdV, VdP, TdS$

34. Which one of the following is correct at constant Pressure?

A. $\left(\frac{\delta H}{\delta S}\right)_P = T$ B. $\left(\frac{\delta G}{\delta T}\right)_P = -S$ C. $\left(\frac{\delta A}{\delta V}\right)_P = -S$ D. $\left(\frac{\delta U}{\delta V}\right)_P = -T$

(1) A & C (2) A, B, & C (3) A & B (4) None of these

35. Isochoric thermal pressure change coefficient for ideals gas is

(1) $\frac{1}{T}$ (2) $\frac{1}{P}$ (3) T (4) P

PART-B

36. The temperature of 36g of water changes from 5°C to 65°C at constant volume. Change in internal energy, (Cp = 75 J/K mole) is

(1) 8 KJ (2) 33.6 K calorie (3) 33.6 KJ (4) 1.9 KJ

37. Consider the following statement:

(I) As atomicity increases value of γ decreases

(II) As atomicity increases slope of PV curve decrease

(III) Slope of isothermal curve is less than adiabatic PV curve

(IV) Slope of PV curve is greater for He gas the CO_2 gas

(1) a is correct

(2) a and b is correct

(3) a, b and c is correct

(4) a, b, c and d is correct

38. Dimension of second and finite thermodynamic equation of state respectively are

(1) m^2, Nm (2) $m^3, N/m^2$ (3) $\frac{N}{m^2}, m^3$ (4) Both Nm^{-2}

39. An ideal monoatomic gas $Cp = 2.5R$ initially at 298K, 2 MPa expands adiabatically & irreversibly until it is in equilibrium with constant pressure of 0.2 MPa. Final temperature of gas is

(1) 82.3°C (2) -82.3°C

(3) -190.7°C (4) 190.7°C

40. Which is incorrect

A. $(dS)_{H,P} \geq 0$ B. $(dS)_{U,V} \geq 0$ C. $(dH)_{S,P} \leq 0$ D. $(dG)_{P,T} \leq 0$

(1) A only (2) B only (3) C only (4) None

41. A mixture of gas expands from 0.03 m^3 to 0.06 m^3 at a constants pressure of 1MPa and absorbs 84 KJ of heat during the process. The change in internal energy of the mixture is

(1) 0 KJ (2) 30 KJ (3) 54 KJ (4) 114 KJ

42. Number of translational, rotational & vibrational mode of pyridine are respectively

(1) 33, 3, 3 (2) 27, 3, 3
(3) 24, 3, 3 (4) 20, 3, 3

43. Refer C_{3V} character table which one is not correct

(1) $a_1 \rightarrow a_1$ transition is z polarized
(2) $a_1 \rightarrow e$ transition is x polarized
(3) $a_1 \rightarrow e$ transition is y polarized
(4) $a_2 \rightarrow e$ transition is z polarized

44. Refer C_{2V} character table

The function $\phi_1 = p_1 + 2p_2 - p_3 - 2p_4$ belongs to

(1) A_1 (2) A_2 (3) B_1 (4) B_2

45. Mullikan symbol for the following

E	C_n	nC_2	i	σ_h
1	-1	-1	+1	+1

(1) B''_{2u} (2) A''_{2u} (3) B'_{2g} (4) A''_{2g}

46. If *yz* is molecular plane then asymmetric stretching mode and symmetric stretching mode of H_2O belongs to irreducible representation respectively

(1) B_2 & A_2 (2) B_2 & B_1
(3) B_1 & B_2 (4) B_2 & A_1

47. In $CH_3^{\oplus}$ carbocation consider the following statements:

(I) A'_1 irreducible representation belongs to parallel vibration
(II) A''_2 irreducible representation belongs to out of plane vibration
(III) E' belongs to perpendicular as well as in plane vibration
(IV) E' is Raman active

(1) I is incorrect (2) I & II is incorrect
(3) All are incorrect (4) All are correct

48. The rate constant for a reaction is $8.0x10^{-15}\ cm^2molecule^{-1}s^1$ at 298K, the rate constant in $dm^3molecule^{-1}s^{-1}$;

(1) $4.8\times10^6\ dm^3mol^{-1}s^{-1}$ (2) $4.8\times10^5\ dm^3mol^{-1}s^{-1}$

(2) $3.2\times10^6\ dm^3mol^{-1}s^{-1}$ (4) $3.2\times10^5\ dm^3mol^{-1}s^{-1}$

49. (Anthracene in benzene solution dimerizes and simultaneously florescence with irradiated with light of certain frequency (ν). The frequency of radiation emitted in florescence in (ν') when $\nu' < \nu$. The mechanism is given as,

$$A + h\nu \xrightarrow{K_1} A^* \quad (Excitation)$$

$$A^* + A \xrightarrow{K_2} A_2 \quad (\text{dimerisation})$$

$$A^* \xrightarrow{K_3} A + h\nu' \quad (fluroscence)$$

The Quantum yield φ the reaction is;

(1) $\dfrac{K_1K_2[A]}{K_2[A]+K_3}$ (2) $\dfrac{K_1[A]}{K_2[A]+K_3}$ (3) $\dfrac{K_3[A]}{K_2+K_3}$ (4) $\dfrac{K_2[A]}{K_2+K_3}$

50. In a lineweiver burk plot the value of X intercept is given as 200 unit and slope is found to be 1000 unit. The TON (Turn over number) , when the concentration of of enzyme was 0.05 unit,

(1) 10^{-4} (2) 10^{-6} (3) 10^{-5} (4) 10^{-3}

51. The activation energy for the formation of HI

$H_2 + I_2 \rightleftharpoons 2HI$ is *163 KJ / mole* H_2, & heat of reaction is *+20* KJ per mole H_2. What is the activation energy for the reaction?

$2HI \rightleftharpoons H_2 + I_2$?

(1) 143 KJ (2) 183 KJ

(3) 20 KJ (4) -163 KJ

52. A reaction proceeds through the formation of an intermediate B, C, D, E in an unimolecular reaction

$$A \xrightarrow{K_a} B \xrightarrow{K_b} C \xrightarrow{K_C} D \xrightarrow{K_d} E \xrightarrow{K_e} F$$

The integrated rate law for the reaction is

(1) $A = A_0\left(\dfrac{K_a}{K_b}\right)e^{-\frac{K_a}{K_b}t}$ (2) $A = A_0e^{-\left(\frac{K_a}{K_b}\right)^2\left(\frac{K_b}{K_a}\right)^{1/2}}$

(3) $A = A_0\left[e^{-K_{at}} - e^{-k_bt} - e^{-K_ct} - e^{-K_gt} - e^{-K_et}\right]$ (4) $A = A_0e^{-\left(\frac{K_a}{K_b}\right)\times\frac{\sqrt{K_b^2}}{K_a^0}\times t}$

53. For the reaction given below the relaxation time is $10^{-6} S$. Given that 10% of A remains at equilibrium, the value of $K_1\left(S^{-1}\right)$ is $A \underset{K_{-1}}{\overset{K_1}{\rightleftharpoons}} B$

(1) 9×10^{5} (2) 10^{-5} (3) 10^{5} (4) 9×10^{-5}

54. In the following sequence of reaction the energy poor molecule A^* in the assuming collision is robbed of enough energy to be deactivated as

$$A + A \underset{K_2}{\overset{K_1}{\rightleftharpoons}} A + A^*, \quad A^* \xrightarrow{K_3} B + C$$

What is the steady-state conc. Of $\left[A^*\right]$

(1) $\dfrac{K_1\left[A\right]^2}{K_2\left[A\right]+K_3}$ (2) $\dfrac{K_2\left[A\right]^2}{K_1\left[A\right]+K_3}$ (3) $\dfrac{K_2\left[A\right]^2}{K_3+K_1}$ (4) $\dfrac{K_2\left[A\right]^2}{K_3}$

55. From the above equations if the rate of deactivation is greater. What is the overall rate constant & overall activation energy

(1) $K_3K_1,\ E_{a_3}+E_{a_1}$ (2) $\dfrac{K_3K_1}{K_2},\ E_{a_1}+E_{a_3}-E_{a_2}$

(3) $\dfrac{K_3K_2}{K_1},\ E_{a_3}+E_{a_2}-E_{a_1}$ (4) $\dfrac{K_3K_1}{K_2},\ E_{a_3}+E_{a_1}-E_{a_2}$

56. Observe the following aqueous solution of same compound, all the measurements are made at same wavelength and same temperature.

Solution A: the transmittance of 0.1 mol dm^{-3} using 1 cm cell is 0.5.

Solution B: The optical density 0.5 mol dm^{-3} is measured using 1 mm cell.

Solution B: The transmittance of this solution is 0.1.

The optical density of these solutions follows the order;

(1) A> B > C (2) B > C > A (3) B > A > C (4) C > A > B

57. For a reaction if the effective rate constant are is given by

$$K^{'} = 2\frac{K_2}{K_3}\left(\frac{K_1}{K_5}\right)^{1/2}$$

Calculate the effective frequency factor. If A_1, A_2, A_3, A_4, A_5 are individual frequency factor

(1) $2\left(\dfrac{A_2}{A_3}\right)\left(\dfrac{A_1}{A_5}\right)$ (2) $2\left(\dfrac{A_2}{A_3}\right)A_5$

(3) $2\dfrac{A_2}{A_3}\left(\dfrac{A_1}{A_5}\right)^{1/\sqrt{4}}$ (4) $\dfrac{A_2}{A_3}\left(\dfrac{A_1}{A_5}\right)^{1/\sqrt{4}}$

58. For a given reaction at temperature T, the velocity constant K is expressed by

$$K = Ae^{-\frac{27000K}{T}}$$

Given $R = 2\ Cal\ mol^{-1}K^{-1}$. Calculate the value of energy of activation

(1) $27{,}000R^2$ (2) $\frac{27{,}000R^2}{N}$ (3) $\frac{27{,}000R}{N}$ (4) $\frac{27{,}000R^3}{N}$

59. In the reaction $^{14}N(\alpha, p)\,^{17}O$, *1.16MeV* of energy is absorbed. Determine the mass of ^{17}O produced. The isotopic mass of ^{4}He is 4.00260 *a.m.u*; mass of proton is 1.00722 *a.m.u.* & that of nitrogen atom is 14.0067 *a.m.u.*

(1) 17.0008 *a.m.u.* (2) 17.008 *a.m.u.* (3) 17.08 *a.m.u.* (4) 17.8 *a.m.u.*

60. Which of the following planes will be absent in a simple cubic system

(1) 100 (2) 110 (3) 111 (4) 200

Referred Character table

- **C_{2v}, T_d, C_{3v}, & D_{3h} POINT GROUP**

C_{2v}	E	C_2	σ_{xz}	σ_{yz}		
A_1	1	1	1	1	Z	x^2, y^2, z^2
A_2	1	1	–1	–1	R_Z	xy
B_1	1	–1	1	–1	x, Ry	xz
B_2	1	–1	–1	1	y, Rx	yz

T_d	E	$8C_3$	$3C_2$	$6S_4$	$6\sigma_d$
A_1	1	1	1	1	1
A_2	1	1	1	–1	–1
E	2	–1	2	0	0
T_1	3	0	–1	1	–1
T_2	3	0	–1	–1	1

C_{3v}	E	$2C_3$	$3\sigma_v$		
A_1	1	1	1	z	x^2+y^2, z^2
A_2	1	1	-1	Rz	
E	2	-1	0	(x,y)(Rx,Ry)	$(x^2-y^2, xy)(xz,yz)$
I		II		III	IV

D_{3h}	E	$2C_3$	$3C_2$	σ_h	$2S_3$	$3\sigma_v$		
A_1'	1	1	1	1	1	1		x^2+y^2, z^2
A_2'	1	1	–1	1	1	–1	R_z	
E'	2	–1	0	2	–1	0	(x, y)	(x^2-y^2, xy)
A_1''	1	1	1	–1	–1	–1		
A_2''	1	1	–1	–1	–1	1	z	
E''	2	–1	0	–2	1	0	(R_x, R_y)	(xz, yz)

p orbitals d orbitals

Test Series #3.

CHEMICAL SCIENCE

PHYSICAL CHEMISTRY

ANSWER KEY

1.(d)	2.(b)	3.(a)	4.(c)	5.(d)	6.(d)	7.(d)	8.(d)	9.(c)	10.(b)
11.(a)	12.(a)	13.(b)	14.(c)	15.(c)	16.(b)	17.(b)	18.(b)	19.(d)	20.(c)
21.(a)	22.(c)	23.(d)	24.(c)	25.(d)	26.(c)	27.(b)	28.(d)	29.(b)	30.(c)
31.(d)	32.(b)	33.(c)	34.(c)	35.(a)	36.(a)	37.(d)	38.(b)	39.(b)	40.(d)
41.(c)	42.(b)	43.(d)	44.(b)	45.(c)	46.(d)	47.(d)	48.(a)	49.(c)	50.(d)
51.(a)	52.(d)	53.(a)	54.(a)	55.(d)	56.(d)	57.(c)	58.(b)	59.(a)	60.(d)