



CBRT - 2020 Question Paper Grid

Government of Goa

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Set Name

Subjects

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Assistant Professor(Chemistry(Inorganic))

Passage:

All cultures, even the simplest, seem to be in a continuous state of change. The earlier anthropologists, as opposed to the moderns, assumed that cultures with relatively simple technology and political structure represented only slightly modified survivors of the ancient conditions of our own ancestors and for that reason dubbed them primitive. Also, largely as a device for simplifying their own theoretical studies, they assumed that such cultures were static or nearly so, persisting unchanged over long time periods. Actually, we have plenty of evidence that this is not the case. Not only do all archaeological records, fragmentary as they are, show change though time, but wherever explorers have visited a primitive tribe at intervals of generation or more, their reports show that changes have taken place. Since there is always the possibility that these changes have been set in motion by the first explorer's visit or by contacts with other Europeans during the intervals, the archaeological evidence is more reliable. From this it appears that changes in technology are the only part of culture on which it provides conclusive evidence, were exceedingly slow during the first nine-tenths of human existence. Thousands of years have gone without the introduction of any new tool or appliance. However, during the last twenty-five or thirty thousand years, there has been a progressive speeding up of cultural change. In their operation, the process of cultural change falls into a definite sequence. The first step is the presentation to the society of a potential addition to its culture. This is followed by the new elements' acceptance or rejection. If accepted there are further processes of modification and integration by which the new elements and the pre-existing culture are brought into adjustment. Lastly, there is usually, but not always, the elimination of an older culture element, or elements where functions have been taken over by the new elements.

A potential element of culture may be invented or borrowed. In either case, the new idea or appliance originates with some individual or at work with a small series of individuals who have either pooled their ingenuity to solve a problem or contributed to improving details during the developments of the invention. There can be no invention or cultural change without an inventor. The main difference between invention and borrowing is that if the new thing originates within the setting provided by the society and its culture, we refer to it as culture borrowing, The processes of acceptance or rejection or integration will be the same, although the attitude of the receiving society towards the one in which the potential element originated may influence acceptance.

Itemcode : NO1071

Q1 : According to the passage,

- (a) modern anthropologists are more systematic and accurate than earlier ones
- (b) a relatively simple society will see progress as spasmodic, resulting from the borrowing of cultural elements
- (c) the last twenty years have been societies rapidly becoming cultured
- (d) cultural interaction is necessary for the cultural progress of primitive societies

Key: **A**

Itemcode : NO1072

Q2 : According to the passage,

- (a) foreign cultural elements are never assimilated in their original form
- (b) assimilation of cultural element is partly dependent on the attitude of the borrower society to the source society
- (c) the process of cultural change is usually random
- (d) self-sufficient societies rely on inventions rather than cultural borrowings

Key: **B**

Itemcode : NO1073

Q3 : According to the author, earlier anthropologists assumed some cultures to be static because

- (a) of insufficient interaction with them
- (b) of poor or unreliable analysis
- (c) it made their task of studying these cultures more simple
- (d) of fragmentary archaeological evidence

Key: **C**

Itemcode : NO1074

Q4 : According to the passage,

- (a) a culture with simple technologies and political structure is likely to be static
- (b) explorers seem to have begun a process of change in many societies
- (c) much of the culture seen today is the result of changes in the recent past
- (d) all cultures seem to have continuous rates of change

Key: **A**

Itemcode : NO1075

Q5 : All the following are essential to the process of borrowing cultural elements, except

- (a) the projection of a particular cultural element as attractive to and suitable for the recipient society
- (b) the displacement of the cultural element performing the same task in the recipient society

- (c) the modification of cultural elements to suit the recipient society
 (d) the widespread acceptance of the new element within the recipient society

Key: **B**

Itemcode : **NO1051**

Q6 : Rozy marks up the cost price of an article by 10% and then reduces the increased price by 10%. What is the minimum number of process does she need to repeat (excluding the first process) so that the cost price of the article reduces by at least 10%?

- (a) 10
 (b) 20
 (c) 15
 (d) 25

Key: **A**

Itemcode : **NO1052**

Q7 : Two men and 3 boys can do a piece of work in 10 days and 3 men and 2 boys can do the same work in 8 days. In how many days can 2 men and 1 boy do half the work?

- (a) 25 days
 (b) 12.5 days
 (c) 6.25 days
 (d) None of these

Key: **C**

Itemcode : **NO1053**

Q8 : Answer the question on the basis of the information given below.

In a batch of 300 students, 60 students passed only in Chemistry, 80 students passed in both Physics and Maths, 90 students passed in both Maths and Chemistry, 130 students passed in Physics and 20 students failed in all the three subjects.

3. What was the minimum number of students who failed only in Physics?

- (a) 20
 (b) 30
 (c) 40
 (d) 10

Key: **D**

Itemcode : **NO1054**

Q9 : Answer the question on the basis of the information given below.

In a batch of 300 students, 60 students passed only in Chemistry, 80 students passed in both Physics and Maths, 90 students passed in both Maths and Chemistry, 130 students passed in Physics and 20 students failed in all the three subjects.

What was the maximum number of students who passed in Chemistry?

- (a) 150
 (b) 180
 (c) 190
 (d) 200

Key: **D**

Itemcode : **NO1055**

Q10 Answer the question on the basis of the information given below.

:

In a batch of 300 students, 60 students passed only in Chemistry, 80 students passed in both Physics and Maths, 90 students passed in both Maths and Chemistry, 130 students passed in Physics and 20 students failed in all the three subjects.

If the number of students who failed in both Maths and Chemistry was equal to number of students who passed in all the three subjects, then out of 18, 28, 38 and 48, which could not be a possible value of the number of students who passed in all the three subjects?

- (a) 18
 (b) 28
 (c) 38
 (d) 48

Key: **A**

Itemcode : **NO1056**

Q11 Mr. Rajiv resides at a flat in an apartment. If his flat is at the 25th floor from the top of the apartment and at the 14th floor from the bottom of the apartment then what are the total number of floors in the apartment?

- (a) 38
 (b) 37
 (c) 39
 (d) 40

Key: **A**

Itemcode : **NO1057**

Q12 In the year 2012, the average age of a family of 3 members was 18 years. Two children having been born (with age difference of 4 years), the present sum of age of the family is 90 years. The present age of the youngest child is :

- (a) 1
- (b) 2
- (c) 3
- (d) 4

Key: **D**

Itemcode : **NO1058**

Q13 A merchant purchases Rice at Rs. x per kg and sells it at Rs. $3x$ per kg still he mixes 1 kg of impurity with every 5 kgs of clean rice. What is the profit percentage?

- (a) 216%
- (b) 260%
- (c) 60%
- (d) 100%

Key: **B**

Itemcode : **NO1059**

Q14 Which situation below is the best example of a 'Guarantee'?

:

- (a) Melissa purchases a DVD player with the highest consumer ratings in its category.
- (b) The salesperson advises Curt to be sure that he buys an air conditioner with a guarantee.
- (c) The local auto body shop specializes in refurbishing and selling used cars.
- (d) Lori buys a used digital camera from her coworker who says that she will refund Lori's money if the camera's performance is not of the highest quality.

Key: **D**

Itemcode : **NO1060**

Q15 Which situation below is the best example of a 'Tiebreaker'?

:

- (a) At halftime, the score is tied at 28.
- (b) Mary and Megan have each scored three goals in the game.
- (c) The referee tosses a coin to decide which team will have possession of the ball first.
- (d) The Sharks and the Bears each finished with 14 points, and they are now battling it out in a five-minute overtime.

Key: **D**

Itemcode : **NO1061**

Q16 'Madhubani', a style of folk paintings, is popular in which of the following states in India?

:

- (a) Uttar Pradesh
- (b) Rajasthan
- (c) Madhya Pradesh
- (d) Bihar

Key: **D**

Itemcode : **NO1062**

Q17 The International Court of Justice is located at

:

- (a) Geneva
- (b) Hague
- (c) Amsterdam
- (d) Vienna

Key: **B**

Itemcode : **NO1063**

Q18 On a rainy day, small oil films on water show brilliant colours. This is due to

:

- (a) dispersion
- (b) interference
- (c) diffraction
- (d) polarization

Key: **B**

Itemcode : **NO1064**

Q19 Grand Central Terminal, Park Avenue, New York is the world's

:

- (a) highest railway station
- (b) longest railway station
- (c) largest railway station
- (d) None of the above

Key: **C**

Itemcode : **NO1065**

Q20 Corey Anderson who has hit the fastest ODI century in 36 balls is from

:

- (a) England
- (b) Australia
- (c) West Indies

(d) New Zealand

Key: **D**Itemcode : **NO1066****Q21** What percentage of land area should remain covered by forest to maintain Ecological balance?

:

- (a) 10%
- (b) 5%
- (c) 33%
- (d) None of these

Key: **C**Itemcode : **NO1067****Q22** Which of the following series is true about energy flow in an ecosystem?

:

- (a) Producers → Decomposers → Consumers
- (b) Decomposers → Consumers → Producers
- (c) Producers → Consumers → Decomposers
- (d) Consumers → Producers → Decomposers

Key: **C**Itemcode : **NO1068****Q23** Layer of atmosphere in which Ozone layer lies is

:

- (a) exosphere
- (b) mesosphere
- (c) troposphere
- (d) stratosphere

Key: **D**Itemcode : **NO1069****Q24** Sattriya is a classical dance form of which State?

:

- (a) Manipur
- (b) Uttar Pradesh
- (c) Assam
- (d) Andhra Pradesh

Key: **C**Itemcode : **NO1070****Q25** Berana is a wedding ceremony of

:

- (a) Punjabi
- (b) Assamese
- (c) Sindhis
- (d) Bengali

Key: **C**Itemcode : **NO1001****Q26** The point group for $\text{Ru}(\text{CO})_5$ is

:

- (a) T_d
- (b) C_{4v}
- (c) D_{3h}
- (d) O_h

Key: **C**Itemcode : **NO1002****Q27** C–O stretching mode symmetries for $\text{Ni}(\text{CO})_4$ are A_1 and T_2 , the IR (Infrared) active modes are

:

- (a) only A_1
- (b) only T_2
- (c) both A_1 and T_2
- (d) none of these

Key: **C**

Itemcode : **NO1003**

Q28 C–O stretching mode symmetries for $\text{Fe}(\text{CO})_5$ are $2A'_1$, A''_2 and E' , the IR (Infrared) active modes are

- (a) $2A'_1$, A''_2
- (b) A''_2 and E'
- (c) $2A'_1$, A''_2 and E'
- (d) $2A'_1$ and E'

Key: **B**Itemcode : **NO1004**

Q29 In the structure of $\text{Mn}(\text{CO})_4(\text{NO})$, NO occupies one corner of the equatorial position because

- (a) CO is a stronger π -accepting ligand than NO
- (b) NO is a stronger π -accepting ligand than CO
- (c) both are equally strong π -accepting ligand
- (d) NO acts as a single electron donor

Key: **B**Itemcode : **NO1005**

Q30 The complex ion $[\text{Re}_2\text{Br}_8]^{2-}$ possesses the following metal-metal bond

- (a) single bond
- (b) double bond
- (c) triple bond
- (d) quadruple bond

Key: **D**Itemcode : **NO1006**

Q31 $\text{Mn}(\text{CO})_4(\text{NO})$ is stable and it fulfills the 18-electron rule because

- (a) NO is single electron donor ligand
- (b) NO is a two-electron donor ligand
- (c) NO is a three-electron donor ligand
- (d) NO is a four-electron donor ligand

Key: **C**Itemcode : **NO1007**

Q32 The greater π -accepting capabilities of the following species in a metal complex fall in the order

- (a) $\text{CN}^- > \text{CO} > \text{NO}^+ > \text{CH}_3^-$
- (b) $\text{CH}_3^- > \text{NO}^+ > \text{CN}^- > \text{CO}$
- (c) $\text{CO} > \text{CH}_3^- > \text{CN}^- > \text{NO}^+$
- (d) $\text{NO}^+ > \text{CO} > \text{CN}^- > \text{CH}_3^-$

Key: **D**Itemcode : **NO1008**

Q33 In diborane there is

- (a) no B-H-B bridging bond
- (b) two two-centred three-electron B-H-B bridging bonds
- (c) one three-centred three-electron B-H-B bridging bond
- (d) two three-centred two-electron B-H-B bridging bonds

Key: **D**Itemcode : **NO1009**

Q34 In dicarba-closo-dodecaborane there are
:

- (a) 12 B atoms and 2 C atoms
- (b) 12 B atoms but no C atoms
- (c) 10 B atoms and 2 C atoms
- (d) 10 B atoms and 4 C atoms

Key: **C**

Itemcode : **NO1010**

Q35 In dicarba-closo-dodecaborane there are
:

- (a) only B-H-B bridging bonds
- (b) 3c-2e B-B-B bonds and B-H-B bridging bonds
- (c) 3c-2e B-B-B bonds and B-H terminal bonds
- (d) B-H terminal bonds and B-H-B bridging bonds

Key: **C**

Itemcode : **NO1011**

Q36 The structure of $[B_{12}H_{12}]^{2-}$ is
:

- (a) a distorted dodecahedron
- (b) a regular icosahedron with many canonical forms
- (c) distorted icosahedron with no canonical forms
- (d) a regular dodecahedron

Key: **B**

Itemcode : **NO1012**

Q37 In the structure of $[B_{12}H_{12}]^{2-}$, there are
:

- (a) 12 faces, each of them being an equilateral triangle
- (b) 12 faces, with alternate equilateral triangles
- (c) 20 faces, each of them being an equilateral triangle
- (d) 20 faces but none of them being an equilateral triangle

Key: **C**

Itemcode : **NO1013**

Q38 The strongest known superacid is a solution of
:

- (a) $H_2SO_4 + SO_3$
- (b) $H_2SO_4 + 2HF$
- (c) $H_2SO_4 + SbF_5$
- (d) $SbF_5 + 2HF$

Key: **D**

Itemcode : **NO1014**

Q39 The following reaction in ammonia solution is correct
:

- (a) $KCl + AgNO_3 \rightarrow AgCl\downarrow + KNO_3$
- (b) $AgCl + KNO_3 \rightarrow KCl\downarrow + AgNO_3$
- (c) $AgNO_3 + KNO_3 \rightarrow KCl\downarrow + AgCl\downarrow + 2NO_3^-$
- (d) $KCl + AgCl \rightarrow AgNO_3 + KNO_3 + 2Cl^-$

Key: **B**

Itemcode : **NO1015**

Q40 The symmetry elements of water molecules are
:

- (a) one C_2 axis, two σ_v planes, and E
- (b) one C_2 axis, two σ_h planes, and E
- (c) two σ_v planes, and E
- (d) two σ_h planes, and E

Key: **A**

Itemcode : **NO1016**

Q41
: The CCl_4 molecule has

- (a) four C_3 axes, three C_2 axes, and six mirror planes
- (b) four C_3 axes, three C_2 axes, and three S_4 improper rotational axes
- (c) three C_2 axes, six mirror planes, and three S_4 improper rotational axes
- (d) four C_3 axes, three C_2 axes, six mirror planes, and three S_4 improper rotational axes

Key: **D**

Itemcode : **NO1017**

Q42
: The point group for $[\text{PtCl}_4]^{2-}$ is

- (a) C_{4v}
- (b) D_{4h}
- (c) C_{2v}
- (d) D_{2h}

Key: **B**

Itemcode : **NO1018**

Q43
: The point group for $[\text{Co}(\text{ethylenediamine})_3]^{3+}$ is

- (a) C_{4v}
- (b) D_{4h}
- (c) C_{2v}
- (d) D_3

Key: **D**

Itemcode : **NO1019**

Q44
: The point group for *trans*- $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ is

- (a) C_{4v}
- (b) D_{4h}
- (c) C_{2v}
- (d) The point group for *trans*- $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ is

Key: **B**

Itemcode : **NO1020**

Q45
: The point group for NH_3 molecule is

- (a) C_{3v}
- (b) D_{4h}
- (c) C_{2v}
- (d) D_{3d}

Key: **A**

Itemcode : **NO1021**

Q46

The infrared (IR) active vibrational mode(s) for the water molecule are

- (a) only symmetrical stretching mode, A_1
- (b) only bending mode, A_1
- (c) only antisymmetrical stretching mode, B_2
- (d) all three, $2A_1$ and B_2

Key: **D**

Itemcode : **NO1022**

Q47 The metal d-orbitals of PtCl_4^{2-} with a D_{4h} symmetry split into

- (a) e_g and t_{2g}
- (b) a_{1g} and e_g
- (c) a_{1g} , e_g and b_{2g}
- (d) a_{1g} , e_g , b_{2g} and b_{1g}

Key: **D**

Itemcode : **NO1023**

Q48 The splitting of the free ion 3F term of d^2 by spin-orbit coupling results in

- (a) $J=2 (-4\lambda)$ and $J=3 (-\lambda)$
- (b) $J=3 (-\lambda)$ and $J=4 (3\lambda)$
- (c) $J=2 (-4\lambda)$ and $J=4 (3\lambda)$
- (d) $J=2 (-4\lambda)$, $J=3 (-\lambda)$ and $J=4 (3\lambda)$

Key: **D**

Itemcode : **NO1024**

Q49 For a d^2 system with the strong field configuration, the t_{2g}^2 gives the following strong field terms

- (a) 3T_1 , 1T_2 and 1E
- (b) 3T_1 , 1T_2 and 1A_1
- (c) 3T_1 , 1T_2 , 1E and 1A_1
- (d) 1T_2 , 1E and 1A_1

Key: **C**

Itemcode : **NO1025**

Q50 Ground strong field term in O_h symmetry for the ground strong field $t_{2g}^6 e_g^3$ configuration for a d^9 low-spin case is

- (a) $^2T_{2g}$
- (b) 2E_g
- (c) $^3A_{2g}$
- (d) $^1A_{1g}$

Key: **B**

Itemcode : **NO1026**

Q51 In photoelectron spectroscopy, if IE is the amount of energy required to overcome the attraction of the nuclei for the ionized electron, and E_n is the energy of the molecular orbital, then according to Koopmans' theorem

- (a) $IE = E_n$
- (b) $IE = -E_n$
- (c) $IE = E_n/2$

(d) $IE = 2E_n$ Key: **B**Itemcode : **NO1027**

Q52 Ground strong field term in O_h symmetry for the ground strong field t_{2g}^5 configuration for a d^5 low-spin case is

(a) ${}^2T_{2g}$ (b) 2E_g (c) ${}^3A_{2g}$ (d) ${}^1A_{1g}$ Key: **A**Itemcode : **NO1028**

Q53 28. The spin-only magnetic moment (μ_{so} in BM) for the tetrahedral compound $(Et_4N)_2FeCl_4$ with 5E ground term is

(a) 3.87

(b) 4.90

(c) 1.73

(d) 5.92

Key: **B**Itemcode : **NO1029**

Q54 The spin-only magnetic moment (μ_{so} in BM) for the octahedral compound $Cr(SO_4)6H_2O$ with 5E_g ground term is

(a) 3.87

(b) 4.90

(c) 2.83

(d) 1.73

Key: **B**Itemcode : **NO1030**

Q55 In the homogeneous catalysis of $[Rh(CO)_2I_2]^-$ in the reaction of methanol (CH_3OH) with carbon monoxide (CO), the major product obtained is

(a) CH_3CH_2OH (b) CH_3CHO (c) CH_3COOCH_3 (d) CH_3COOH Key: **D**Itemcode : **NO1031**

Q56 The homogeneous catalysis of $[Rh(CO)_2I_2]^-$ in the reaction of $CH_3CO_2CH_3$ with CO results in

(a) CH_3CH_2OH (b) CH_3CHO (c) $(CH_3CO)_2O$ (d) CH_3COOH Key: **C**Itemcode : **NO1032**

Q57 In the $[PdCl_4]^{2-}$ catalyzed reaction of ethylene with molecular oxygen the major product formed is

(a) CH_3CH_2OH

- (b) CH_3CHO
 (c) $(\text{CH}_3\text{CO})_2\text{O}$
 (d) CH_3COOH

Key: **B**

Itemcode : **NO1033**

Q58 : In the $[\text{PdCl}_4]^{2-}$ catalyzed reaction of ethylene with molecular oxygen, $\text{H}_2\text{C}=\text{CH}_2$

- (a) does not coordinate to $[\text{PdCl}_4]^{2-}$
 (b) coordinates to $[\text{PdCl}_4]^{2-}$ by replacing one Cl ligand
 (c) coordinates to $[\text{PdCl}_4]^{2-}$ but does not replace any Cl ligand
 (d) coordinates to $[\text{PdCl}_4]^{2-}$ by replacing two Cl ligands

Key: **B**

Itemcode : **NO1034**

Q59 : In the $[\text{PdCl}_4]^{2-}$ catalyzed reaction of ethylene with molecular oxygen, Pd^{2+}

- (a) does not change its oxidation state at any point of catalysis
 (b) changes its oxidation state to +1 during catalysis
 (c) changes its oxidation state to zero and loses all the ligands at some point of its catalytic cycle
 (d) loses all the ligands but does not change its oxidation state at any stage

Key: **C**

Itemcode : **NO1035**

Q60 : The first carbene complex reported by Fischer and Maasböl in 1964 was prepared from the reaction of RLi with

- (a) $\text{Fe}(\text{CO})_5$
 (b) $\text{Cr}(\text{CO})_6$
 (c) $\text{Ru}(\text{CO})_5$
 (d) $\text{W}(\text{CO})_6$

Key: **D**

Itemcode : **NO1036**

Q61 : The product obtained in the synthesis of first carbene complex reported by Fischer and Maasböl in 1964 was

- (a) $\text{RC}(\text{OMe})=\text{Fe}(\text{CO})_5$
 (b) $\text{RC}(\text{OMe})=\text{Cr}(\text{CO})_5$
 (c) $\text{RC}(\text{OMe})=\text{Ru}(\text{CO})_5$
 (d) $\text{RC}(\text{OMe})=\text{W}(\text{CO})_5$

Key: **D**

Itemcode : **NO1037**

Q62 : The molecule $(\text{Me}_2\text{P}-\text{CH}_2-\text{CH}_2-\text{PMe}_2)\text{W}(\text{CCMe}_3)(\text{CH}_2\text{CMe}_3)(\text{CHCMe}_3)$ contains

- (a) only carbene ligands
 (b) only carbyne ligands
 (c) both carbene and carbyne ligands but no alkyl ligand
 (d) carbene, carbyne and alkyl ligands

Key: **D**

Itemcode : **NO1038**

Q63 : The molecule $\text{W}(\text{CO})_2(\text{C}_5\text{H}_5)_2$ contains

- (a) one η^1 -C₅H₅ and one η^5 -C₅H₅ ligands
 (b) two η^5 -C₅H₅ ligands
 (c) one η^3 -C₅H₅ and one η^5 -C₅H₅ ligands
 (d) one η^1 -C₅H₅ and one η^3 -C₅H₅ ligands

Key: **C**Itemcode : **NO1039**

Q64
 : The molecule Fe₂(CO)₉ contains

- (a) Two bridging CO and one Fe-Fe bond
 (b) Three bridging CO and one Fe-Fe bond
 (c) Three bridging CO but no Fe-Fe bond
 (d) Four bridging CO but no Fe-Fe bond

Key: **B**Itemcode : **NO1040**

Q65
 : The molecule Fe₃(CO)₁₂ contains

- (a) no Fe-Fe bond
 (b) no terminal CO ligand
 (c) no bridging CO ligand
 (d) terminal CO ligands but no Fe-Fe bond

Key: **C**Itemcode : **NO1041**

Q66
 : The value of the Rydberg constant R_H is

- (a) 677 cm⁻¹
 (b) 109 cm⁻¹
 (c) 677109 cm⁻¹
 (d) 109677 cm⁻¹

Key: **D**Itemcode : **NO1042**

Q67
 : The energy of the ground state of the hydrogen atom with n=1 is given by

- (a) $E_1 = -hcRZ$
 (b) $E_1 = -hcRZ^2$
 (c) $E_1 = -hcR^2Z^2$
 (d) $E_1 = -hRZ^2$

Key: **B**Itemcode : **NO1043**

Q68
 : The energy of the first excited state of the hydrogen atom with n=2 is given by

- (a) $E_2 = -hcRZ^2$
 (b) $E_2 = -2hcRZ^2$
 (c) $E_2 = -\frac{1}{2}(hcRZ^2)$
 (d) $E_2 = -\frac{1}{4}(hcRZ^2)$

Key: **D**Itemcode : **NO1044**

Q69
 : The selection rule for the allowed spectroscopic transitions for hydrogenic atoms are

- (a) $\Delta l = \pm 1, \Delta m_l = 0$
 (b) $\Delta l = \pm 1, \Delta m_l = 0, \pm 1$
 (c) $\Delta l = \pm 1, \Delta m_l = \pm 1$
 (d) $\Delta l = 0, \Delta m_l = 0, \pm 1$

Key: **B**Itemcode : **NO1045**

Q70 The magnitude of the angular momentum of a p electron is :

- (a) $2^{1/2} \hbar$
 (b) $2 \hbar$
 (c) $1/2 \hbar$
 (d) $1/4 \hbar$

Key: **A**Itemcode : **NO1046**

Q71 Each p subshell consists of three orbitals with the corresponding m_l values given by :

- (a) $m_l = +1, +2, +3$
 (b) $m_l = 0, +1, +2$
 (c) $m_l = +1, 0, -1$
 (d) $m_l = 0, -1, -2$

Key: **C**Itemcode : **NO1047**

Q72 In the spectrum of atomic hydrogen, the Lyman series of lines lie in the :

- (a) visible region (800 to 400 nm)
 (b) UV-region (400 to 200 nm)
 (c) far UV region (lower than 200 nm)
 (d) infrared (IR) region (>1000 nm)

Key: **C**Itemcode : **NO1048**

Q73 In photoelectron spectroscopy, when ionizing photons in the ultraviolet (UV) range are used :

- (a) inner core electrons are ejected
 (b) valence-level electrons are ejected
 (c) both core and valence-level electrons are ejected
 (d) no electrons are ejected

Key: **B**Itemcode : **NO1049**

Q74 In photoelectron spectroscopy, when X-rays are used :

- (a) inner core electrons are ejected
 (b) valence-level electrons are ejected
 (c) both core and valence-level electrons are ejected
 (d) no electrons are ejected

Key: **A**Itemcode : **NO1050**

Q75 In photoelectron spectroscopy, if IE is the amount of energy required to overcome the attraction of the nuclei for the ionized electron, and E_n is the energy of the molecular orbital, then according to Koopmans' theorem

- (a) $\mathbf{IE} = E_n$
(b) $\mathbf{IE} = -E_n$
(c) $\mathbf{IE} = E_n/2$
(d) $\mathbf{IE} = 2E_n$
Key: **B**