PART (B) : CHEMISTRY

SECTION – I : SINGLE CORRECT ANSWER TYPE
(Maximum Marks : 45)

This section contains 15 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which ONLY ONE is correct.

Marking Scheme : +3 for correct answer, 0 if not attempted and -1 in all other cases.

21. A compound is analysed and found to consist of 50.4% Ce, 15.1% N and 34.5% O by mass. What is the correct empirical formula for the compound? (At. wt. of Ce = 140)
(A) $Ce_2(NO_3)_2$
(B) $Ce_2(NO_2)_3$
(C) $Ce(NO_3)_2$
(D) $Ce(NO_2)_3$

22. Which statement is 'False'?
(A) An electron that has $n = 5$ could be in an s, p, d or f sub-level.
(B) If an electron has quantum number $l = 2$, the only possible values of m are 0 and 1.
(C) If an electron has $m = 1$, it might be in a p, d or f sub-level but not in an s sub-level.
(D) An electron that has $n = 3$ cannot be in an f sub-level

23. Identify the incorrect statement(s).
(I) The maximum probability of finding electron in the $d_{x^2-y^2}$ orbital is at an angle of 45° from X and Y-axes.
(II) Each f-orbtial has a total of three nodes.
(III) At same velocity a neutron has lesser wave length than a proton.
(A) I and II
(B) II and III
(C) I and III
(D) All of these

24. When a hydrogen atom emits a photon of energy 10.2 eV. The change in angular momentum according to Bohr's model is
(A) $\frac{h}{\pi}$
(B) $\frac{h}{2\pi}$
(C) $\frac{h}{4\pi}$
(D) $\frac{2h}{\pi}$

25. The correct hydration energy order is :
(A) $Fe^{2+} > Fe^{3+}$
(B) $Cu^{2+} < Cu^{+}$
(C) $K^{+} > Cs^{+}$
(D) $F^{-} < Br^{-}$

26. If the speed of electron in first Bohr's orbit of hydrogen atom is x then speed of electrons in second orbit of Be^{3+} is
(A) x
(B) $\frac{x}{2}$
(C) $2x$
(D) $4x$

27. If the shortest wavelength of the spectral line of He^{+} in Lyman series is X then the longest wavelength of the line in Balmer series of Li^{2+} is
(A) $\frac{5X}{4}$
(B) $\frac{4X}{5}$
(C) $\frac{16X}{5}$
(D) $9X$

28. Accordig to VBT, which of the following overlapping results π-type covalent bond in O_2 molecule formation, when Z-axis is internuclear axis?
(I) $2s - 2s$ (II) $2p_x - 2p_x$ (III) $1s - 1s$ (IV) $2p_y - 2p_y$
(V) $2p_z - 2p_z$
(A) I, III
(B) II, V
(C) II, IV
(D) IV, V

29. Which orbitals of two atoms produce δ-bond (four lobe interaction) ?
(A) $d_{z^2} \longrightarrow$ Overlap on Z-axis $\longleftarrow d_{z^2}$
(B) $d_{xy} \longrightarrow$ Overlap on X-axis $\longleftarrow d_{xy}$
(C) $d_{x^2-y^2} \longrightarrow$ Overlap on Y-axis $\longleftarrow d_{x^2-y^2}$
(D) $d_{xz} \longrightarrow$ Overlap on Y-axis $\longleftarrow d_{xz}$

30. 10 g impure NaOH is neutralise by 100 ml of 1 M HCl. The percentage purity of NaOH is
(A) 80%
(B) 40%
(C) 20%
(D) 50%

31.

Reaction	Energy involved
$P(g) \rightarrow P^+(g) + e$	E_1
$S(g) \rightarrow S^+(g) + e$	E_2
$P^+(g) \rightarrow P^{2+}(g) + e$	E_3
$S^+(g) \rightarrow S^{2+}(g) + e$	E_4

Correct option :-
(A) $E_1 > E_2 > E_3 > E_4$
(B) $E_4 > E_3 > E_1 > E_2$
(C) $E_4 > E_3 > E_2 > E_1$
(D) $E_3 > E_4 > E_1 > E_2$

32. Which of the following order is correct for dipole moment?
(A) $CH_3F > CH_3Cl > CH_3Br > CH_3I$
(B) $CH_3Cl > CH_3Br > CH_3F > CH_3I$
(C) $CH_3Br > CH_3Cl > CH_3I > CH_3F$
(D) $CH_3Cl > CH_3F > CH_3Br > CH_3I$

33. Total no. of planes which contains 4 atoms in a plane are maximum in :
(A) CH_4
(B) PCl_5
(C) XeF_4
(D) SF_4

34. What minimum amount of energy is required to remove electron from ground state of Be^{+3} to infinity?
(A) 4.358×10^{-18} J
(B) 2.179×10^{-18} J
(C) 3.4864×10^{-17} J
(D) 8.716×10^{-18} J

35. All fluorine atoms are in same plane in:
(A) CHF_3
(B) ClF_3
(C) $XeOF_4$
(D) All of these

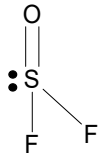
SECTION – II : MULTIPLE CORRECT ANSWER TYPE
(Maximum Marks : 15)

This section contains 5 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONE OR MORE than ONE option can be correct.

Marking Scheme : +3 for correct answer, 0 if not attempted and 0 in all other cases.

36. Select the pair in which the Ist ionisation energy is greater for the 2nd element compared to Ist element.
(A) Be, B
(B) B, C
(C) C, N
(D) N, O

37. Incorrect order of ionic size of elements :
(A) $Mn^{7+} > Mn^{6+} > Mn^{4+}$
(B) $C^{+} > C > C^{-}$
(C) $Fe^{3+} > Fe^{2+} > Fe$
(D) $P^{3-} > P > P^{3+}$

38. What is the correct order of bon angle of the following molecule?
(A) $\overset{\alpha}{CF_4}, \overset{\beta}{CCl_4}, \overset{\gamma}{CBr_4}$, $\angle XMX$ bond angle ; $\alpha > \beta > \gamma$ (X = Halogen atom)
(B) $NCl_3 > PCl_3 > AsCl_3$; $\angle ClMCl$ bond angle (M = Central atom)
(C)  ; $\angle FSO > \angle FSF$ bond angle
(D) $NO_2^{+} > NO_2 > NO_2^{-}$; $\angle ONO$ bond angle

39. 1 g of Mg was burnt in a closed vessel containing 2 g oxygen. Which of the following are not correct?
(A) 0.25 g of Mg will be left unburnt
(B) 1.33 g of O_2 will be left unreacted
(C) 2.5 g of MgO will be formed
(D) The mixture at end will weigh 3 gm

40. Select correct order for size of atom.
(A) He < Ne < Ar
(B) F < Ne
(C) Cl < Ar
(D) F < Cl