SECTION A

1 Which one of the following pairs is iso structural (i.e., having the same shape and hybridization)?
1. $[BCl_3 \text{ and } BrCl_3]$
2. $[NH_3 \text{ and } NO_3^-]$
3. $[NF_3 \text{ and } BF_3]$
4. $[BF_4^- \text{ and } NH_4^+]$

2 The number of significant figures in 1.0001 are
1. 1
2. 2
3. 4
4. 5

3 Which of the following is the correct order of dipole moment?
1. $NH_3 < BF_3 < NF_3 < H_2O$
2. $BF_3 < NF_3 < NH_3 < H_2O$
3. $BF_3 < NH_3 < NF_3 < H_2O$
4. $H_2O < NF_3 < NH_3 < BF_3$

4 1 Poise is equal to
1. 0.1 kg m^{-1} s^{-1}
2. 1 kg m^{-1} s^{-1}
3. 10 kg m^{-1} s^{-1}
4. 0.01 kg m^{-1} s^{-1}

5 The important condition/s required for the linear combination of atomic orbitals to form molecular orbitals is:

1.	The combining atomic orbitals must have the exact or nearly the same energy.
2.	The combining atomic orbitals must have proper symmetry about the molecular axis.
3.	The combining atomic orbitals must overlap to the maximum extent.
4.	All of these.

6 Which of the following pairs of chemical reactions is certain to result in a spontaneous reaction -
1. Endothermic and decreasing disorder
2. Exothermic and increasing disorder
3. Endothermic and increasing disorder
4. Exothermic and decreasing disorder

7 The total energy of 1 mol of photons in J/mol having $\lambda = 600\ nm$ is-
Given: $h = 6.62 \times 10^{-34}$ J sec, c $= 3 \times 10^8$ m s^{-1}
1. $2 \times 10^5 J/mol$
2. $6.64 \times 10^8 J/mol$
3. $1.24 \times 10^4 J/mol$
4. $1.24 \times 10^8 J/mol$

8 On a ship sailing in Pacific Ocean where temperature is 23.4°C, a balloon is filled with 2 L air. When the ship reaches Indian ocean, where temperature is 26.1°C, the volume of the balloon is-
1. 3.018 L
2. 5. 018 L
3. 2.018 L
4. 6.018 L

9 The shape of $IO_2F_2^-$ ion is:
1. Linear
2. Trigonal bipyramidal
3. T-shaped
4. See-saw

10 Consider the following reaction:
$CS_2 + 3O_2 \rightarrow CO_2 + 2SO_2$
How much carbon disulfide must be used to produce 64 grams of SO_2?
1. 38 g
2. 57 g
3. 76 g
4. 114 g

11 Which of the following trends of atomic sizes are correct ?
1. F > N > O > C
2. Rb > Na > K > Li
3. Be > B > C > N
4. Ne >He > Ar > Kr

12 Among the following, the correct representation of first ionization enthalpy for Ca, Ba, S, Se and Ar in increasing order, is -
1. Ba < Ca < Se < S < Ar
2. Ca < Ba < S < Se < Ar
3. Ca < S < Ba < Se < Ar
4. S < Se < Ca < Ba < Ar

13 Consider the following compound,

LiCl, BeF_2, BCl_3, IF_7, CH_4, SF_6, PCl_5

The total number of compounds having expanded octet around the central atom are:

1. 2
2. 4
3. 5
4. 3

14 Mass of H_2O formed on reaction of 11.2 L H_2 and excess O_2 at STP will be

1. 18 g
2. 9 g
3. 36 g
4. 4.5 g

15 The incorrect statement from the following is:

1.	The sigma bond forms via head-on overlap and the pie bond forms via sidewise overlapping of orbitals.
2.	s and p orbitals are combined to form a sigma bond as well as a pie bond.
3.	Hybrid orbitals only form sigma bonds.
4.	Sigma bonds are stronger than pie bonds.

16 Which of the following has maximum mass ?

1. 0.1 gram molecule oxygen
2. 10 ml H_2O at STP
3. 3.01×10^{22} molecules H_2SO_4
4. 1 gram atom hydrogen

17 Which of the following statements is correct?

I. Heisenberg uncertainty equation $\Delta x.\Delta p \geq \frac{h}{4\pi}$ where ΔP and Δx are uncertainty in momentum and position respectively

II. Bohr model of the hydrogen atom, therefore, considers the dual behavior of matter but also agree with Heisenberg's uncertainty principle.

III. Bohr's theory was also unable to explain the splitting of spectral lines in the presence of magnetic field (Zeeman effect) or an electric field (Stark effect).

IV. Order of energy level for the hydrogen atom is 1s < 2s < 2p < 3s

1. Only IV is correct
2. I, II, and III are correct
3. II and III are correct
4. I and III are correct

18 At 27 °C, PCl_5 is 50 % dissociated. What is the value of ΔG^o at 27 °C and one atmosphere?

1. ΔG^o = -300 R ln3
2. ΔG^o = +300 R ln3
3. ΔG^o = -900 R ln3
4. ΔG^o = +900 R ln3

19 An equilibrium mixture of the reaction $2H_2S(g) \rightleftharpoons 2H_2(g) + S_2(g)$ had 0.5 mole H_2S, 0.10 mole H_2, and 0.4 mole S_2 in one litre vessel. The value of equilibrium constant (K_c) in mol litre^{-1} is:

1. 0.004
2. 0.008
3. 0.016
4. 0.160

20 1 mol monoatomic ideal gas expanded against 2 atm pressure from 10 L to 60 L at 27°C. Work done in above process is

1. –10 L-atm
2. –100 L-atm
3. –200 L-atm
4. –400 L-atm

21 The precipitate of CaF_2 (Ksp = 1.7×10^{-10}) is obtained when equal volumes of the following are mixed

1. 10^{-4}M $Ca^{2+} + 10^{-4}$M F^-
2. 10^{-2}M $Ca^{2+} + 10^{-3}$M F^-
3. 10^{-4}M $Ca^{2+} + 10^{-3}$M F^-
3. 10^{-3}M $Ca^{2+} + 10^{-5}$M F^-

22 If the heat produced by $4A + 3O_2 \rightarrow 2A_2O_3$ is 2000 kJ, then the heat of combustion($\Delta H^o_{combustion}$) of "A" is:

1. -2000 kJ/mole
2. -1000 kJ/mole
3. -500 kJ/mole
4. -250 kJ/mol

23 XY_2 dissociates as,

$XY_2(g) \rightleftharpoons XY(g) + Y(g)$

The initial pressure of XY_2 is 600 mm Hg. The total pressure at equilibrium is 800 mm Hg. Assuming the volume of the system to remain constant, the value of Kp is:

1. 50
2. 100
3. 20
4. 400

24 Which of the following is an intensive property ?
1. free energy
2. Specific heat
3. Heat capacity
4. Entropy

25 For oxidation of iron, $4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s)$, ΔH_r°=-1648 x 10^3 J mol^{-1} and entropy change is -549.4 J $K^{-1}mol^{-1}$ at 298 K:-
The reaction is:
1. Spontaneous
2. Non-spontaneous
3. At Equilibrium
4. Can't predict

26 How many compounds have the same degree of unsaturation?
(A) $CH_3 - CH = CH - C \equiv N$
(B) $CH_3 - N = CH - C \equiv CH$
(C) $CH \equiv C - NH - CH = CH_2$
(D) $CH_2 = CH - CH_2 - C \equiv N$
1. 2
2. 3
3. 0
4. 4

27 In the Solvay process, for the formation of sodium carbonate, ammonia is converted to
1. NH_2-NH_2
2. NH_4OH
3. NH_4HCO_3
4. NH_4NO_3

28 Which one is incorrect statement for H_2O_2?
1. It decomposes slowly on exposure to light
2. It has a non-planar structure
3. It is immiscible in water
4. It shows its oxidizing action both in acidic and basic medium

29 In an organic compound of molar mass 108 g mol^{-1}, C, H, and N atoms are present in a 9:1:3.5 by weight ratio. The molecular formula of the organic compound is:
1. $C_6H_8N_2$
2. $C_7H_{10}N$
3. $C_5H_6N_3$
4. $C_4H_{18}N_3$

30 The number of moles of $KMnO_4$ reduced by one mole of *KI* in an alkaline medium is:
1. One fifth
2. five
3. One
4. Two

31 The oxidation state of central bromine atom in Br_3O_8 is
1. Zero
2. +3
3. +4
4. +7

32 The incorrect statement(s) among the following is/are:

a.	The spots of colorless compounds in TLC can be detected by putting the plate under infrared light.
b.	Carbohydrate is detected by spraying the plate with ninhydrin solution.
c.	Chromatography paper contains water trapped in it, which acts as the stationary phase.

1. Only a
2. Both a and b
3. Both b and c
4. only c

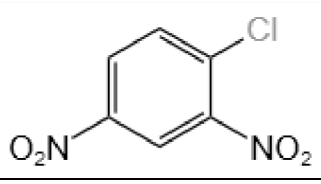
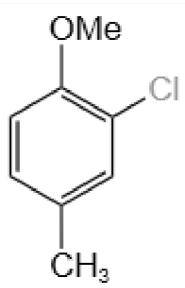
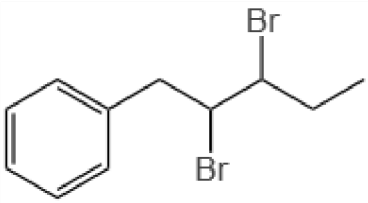
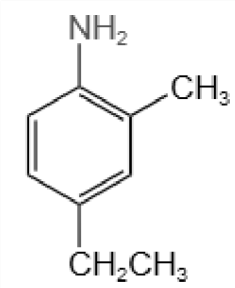
33 Alkali metals (M) dissolve in liquid NH_3 to give
1. MNH_2
2. MH
3. $[M(NH_3)_x]^+ + [e(NH_3)_y]^-$
4. M_3N

34

Assertion (A):	Addition of $HCl(aq.)$ to $HCOOH(aq.)$ decrease the ionization of $HCOOH(aq.)$
Reason (R):	Due to the common ion effect of H^+, ionization of $HCOOH$ decrease.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	**(A)** is false but **(R)** is true.

35 Incorrect match among the following is:

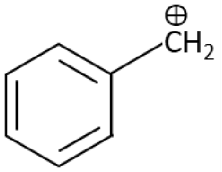
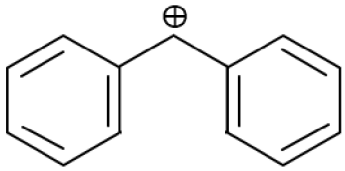
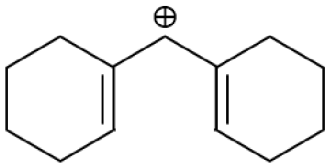
Structure	IUPAC name
1. 	4-Chloro-1,3-dinitrobenzene
2. 	2-Chloro-4-methylanisole
3. 	2,3-Dibromo-1-phenylpentane
4. 	4-Ethyl-2-methylaniline

SECTION B

36 Which of the following compound is added to the sodium extract before the addition of silver nitrate for testing of halogens?

1. Nitric acid
2. Ammonia
3. Hydrochloric acid
4. Sodium hydroxide

37 Hyperconjugation occurs in:

1.	
2.	
3.	
4.	None of these

38 Which of the following are Lewis acids?

(i) $B(OH)_3$; (ii) H_2O

(iii) HSO_4^- ; (iv) SO_3 1. (i) and (iii)

2. (i) and (ii)
3. (i) and (iv)
4. (iii) and (iv)

39 When 50% H_2SO_4 solution is electrolysed, then H_2O_2 and H_2 will be evolved respectively at

1. cathode and anode
2. cathode and cathode
3. anode and cathode
4. anode and anode

40 The equilibrium constants are K_1 and K_2 for the reactions $H_2(g) + \frac{1}{2}S_2(s) \rightleftharpoons H_2S(g)$ and $H_2(g) + Br_2(g) \rightleftharpoons 2HBr(g)$, respectively. The equilibrium constant for the reaction $Br_2(g) + H_2S(g) \rightleftharpoons 2HBr(g) + \frac{1}{2}S_2(s)$ would be:

1. $K_1 \times K_2$
2. K_1/K_2
3. K_2/K_1
4. K_2^2/K_1

41 Correct statement(s) among the following is/are:

A.	Hydrides of group 13 act as Lewis acids
B.	On the addition of gypsum to cement, the setting time increases.
C.	Diamond is the thermodynamically most stable allotrope of carbon.
D	Beryllium exhibits a coordination number of more than four.
E.	Beryllium is not readily attacked by acids because of the presence of an oxide film on the surface of the metal.

Choose the correct answer from the options given below:

1. A and C only
2. B and C only
3. A and E only
4. A, B, and E only

42 Consider the following statements,

a.	CO is a powerful oxidizing agent and oxidized almost all metal oxides.
b.	The order of catenation is C > > Si > Ge ≈ Sn in 14th group element.
c.	$SiCl_4$ on hydrolysis forms silicic acid as a product.

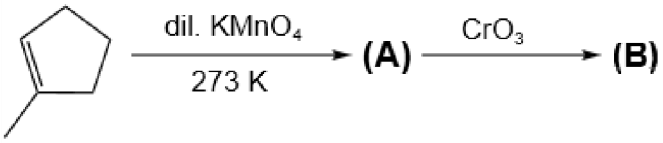
The correct statement(s) is/are:

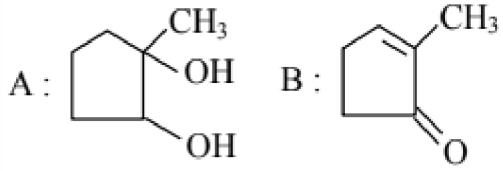
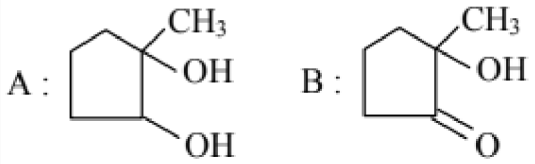
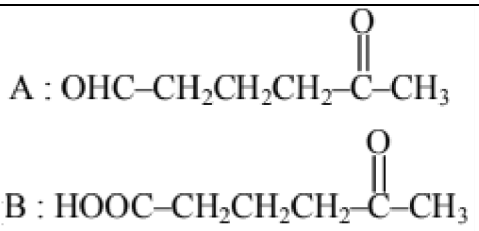
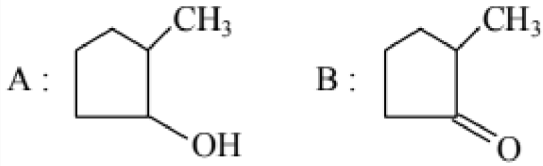
1. Only a
2. Both a and b
3. Both b and c
4. Both a and c

43 The pollutants which come directly in the air from sources are called primary pollutants. Primary pollutants are sometimes converted into secondary pollutants. Which of the following belongs to secondary air pollutants?

1. CO
2. Hydrocarbon
3. Peroxyacetyl nitrate
4. NO

44 Identify products A and B in the given below reaction:



1.	
2.	
3.	
4.	

45 The electrophilic aromatic substitution proceeds through a:

1. Free radical mechanism
2. Sigma complex mechanism
3. Benzyne mechanism
4. Carbene mechanism

46 Consider the following molecule.

(a) H_3C-H, H_3C-Br

(b) H_3C-NH_2, H_3C-OH

(c) H_3C-OH, H_3C-SH

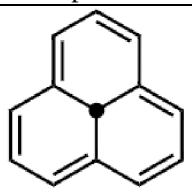
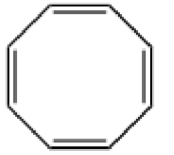
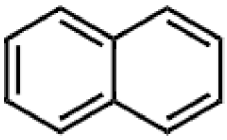
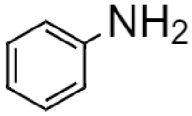
The bond which is more polar in the given pairs of molecules is-

1.	C-H bond is more polar than C-Br bond; C-O is more polar than C-N and C-S bond
2.	C-Br bond is more polar than C-H bond; C-O is more polar than C-N and C-S bond
3.	C-Br bond is more polar than C-H bond; C-N is more polar than C-O and C-O bond is more polar than C-S
4.	None of the above

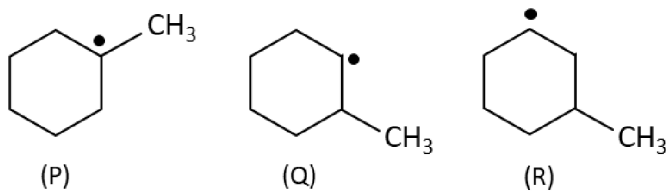
47 Which of the following statement(s) is wrong?

1.	Ozone is not responsible for the greenhouse effect.
2.	Ozone can oxidize sulfur dioxide present in the atmosphere to sulfur trioxide.
3.	Ozone hole is thinning of the ozone layer present in the stratosphere.
4.	Ozone is produced in the upper stratosphere by the action of UV rays on oxygen.

48 Which of the following is not an example of the benzenoid compound?

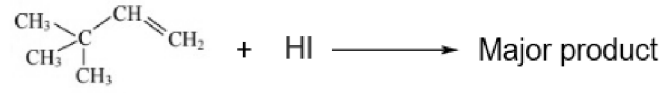
1.		2.	
3.		4.	

49 Which of the following orders is correct for the hyperconjugation of these radicals?

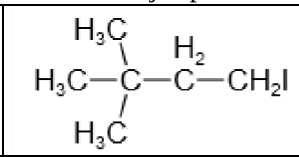
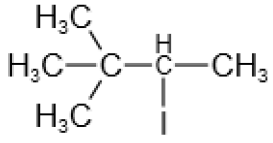
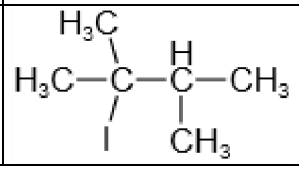
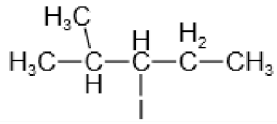


1. P > Q > R
2. R > Q > P
3. Q > P > R
4. P > R > Q

50 Consider the following reaction,



What is the major product in the above reaction?

1.		2.	
3.		4.	

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