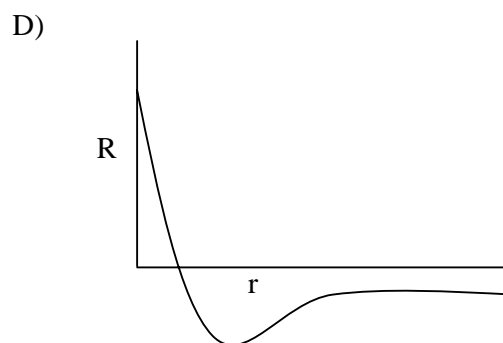
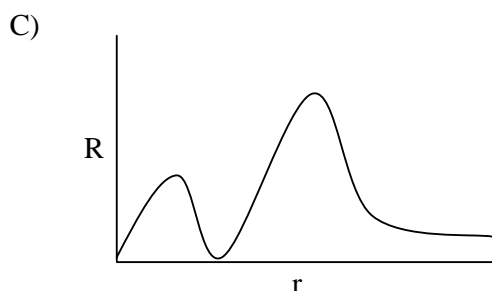
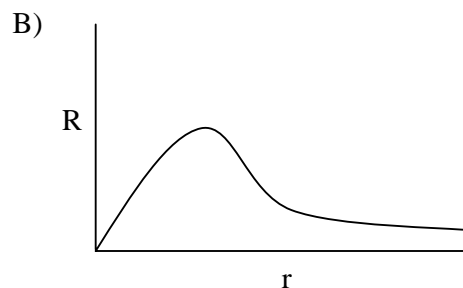
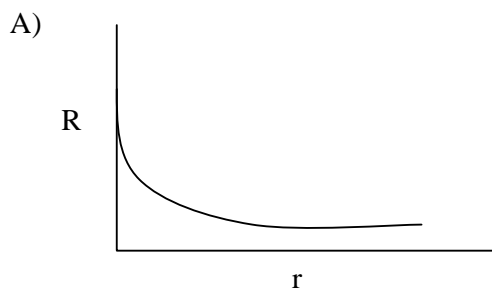


PART II – CHEMISTRY

1. Which of the following curves correctly represents the variation of the 2p orbital wave function with the distance from the nucleus?



2. Excess bond energy (Δ_{AB}) of a heteropolar bond A-B is related to the corresponding Pauling electronegativity difference as

A) $(\chi_A - \chi_B) \propto \sqrt{\Delta_{AB}}$

B) $(\chi_A - \chi_B) \propto (\Delta_{AB})^2$

C) $(\chi_A - \chi_B) \propto \log(\Delta_{AB})$

D) $(\chi_A - \chi_B) \propto \Delta_{AB}$

3. The correct set of four quantum numbers for the outermost electron of Rubidium ($Z = 37$) is

A) 5, 0, 0, $-1/2$

B) 5, 1, 0, $+1/2$

C) 5, 1, 1, $+1/2$

D) 6, 0, 0, $+1/2$

4. First ionization enthalpy of group 16 elements are lower than that of group 15 elements because

A) Group 15 elements have half-filled stability

B) Group 16 elements show poor shielding

C) Group 16 elements have half-filled stability

D) Group 15 elements show poor shielding

5. Some of the phosphorous-oxygen bonds in phosphorus pentoxide are attributed to π -back bonding. In such π -bond

A) an empty p orbital on O atom overlaps with a full sp^3 orbital on P

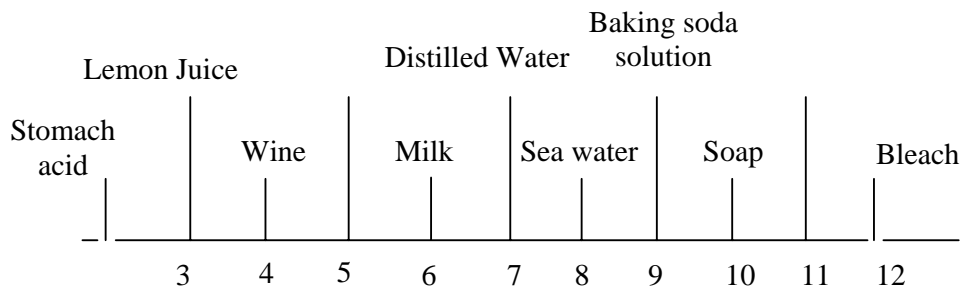
B) an empty p orbital on O atom overlaps with a full d orbital on P

C) a partly filled p orbital on O atom overlaps with a partly filled d orbital on P

D) a full p orbital on O atom overlaps with an empty d orbital on P

6. A compound formed by element A and B, crystallizes in the cubic structure. When atoms of A are at the corners of the cube and B atoms are at the face centres, the formula of the compound is
- A) AB B) AB₃ C) A₃B D) AB₂
7. The coordination number of 'Co' in $[Co(NH_3)_4(H_2O)Cl]Cl_2$ is
- A) 4 B) 5 C) 6 D) 8
8. The absolute configuration of the chiral centers present in *meso* tartaric acid is
- A) 1S, 2R B) 1D, 2L C) 1R, 2R D) 1S, 2S
9. Which of the following compounds exhibits stereo isomerism?
- A) 3 – methylbutanoic acid B) 3 – methylbutene – 1
C) 2 – methylbutene – 1 D) 2 – methylbutanoic acid
10. Simple ethers are considered as derivatives of water in which both hydrogen atoms have been replaced with which of the following?
- A) Alkyl groups B) Nitrile group C) Hydroxyl groups D) Alkoxy groups
11. A sodium ion is moved out of the lattice of NaCl causing Frenkel defect. The ion is expected to occupy a site with in the NaCl structure and posses a coordination number of
- A) three B) four C) six D) eight
12. A compound formed by element A and B, crystallizes in the cubic structure. When atoms of A are at the corners of the cube and B atoms are at the face centres, the formula of the compound is
- A) AB B) AB₂ C) A₃B D) AB₃
13. The coordination number of 'Co' in $[Co(NH_3)_4(H_2O)Cl]Cl_2$ is
- A) 4 B) 5 C) 6 D) 8
14. The reaction $A \rightarrow B$ follows first order kinetics. The time taken for 0.8 mole of A to produce 0.6 mole of B is 1 hour. What is the time taken for conversion of 0.9 mole of A to produce 0.675 mole of B?
- A) 1 hour B) 0.25 hour C) 0.5 hour D) 2 hours

15. The figure shows the pH values of some substances



Which of the following statement about the concentration of hydrogen ions is correct?

- A) It is twice as great in milk as that in lemon juice
 B) It is 1000 000 times greater in soap than in wine
 C) It is three times greater in wine than in bleach solution
 D) It is 1000 times greater in distilled water than in soap
16. $E^0 (\text{Zn}^{2+}/\text{Zn}) = - 0.762\text{V}$, $E^0 (\text{Pb}^{2+}/\text{Pb}) = - 0.126\text{V}$. If an electrochemical cell involving $\text{Zn}^{2+} (1\text{M}) \mid \text{Zn}$ and $\text{Pb}^{2+} (1\text{M}) \mid \text{Pb}$ is set up such that there is spontaneous conversion of chemical energy to electrical energy, the overall emf will be
- A) +0.636V and zinc will be deposited B) + 0.888V and zinc will be deposited
 C) - 0.888V and lead will be deposited D) - 0.636V and lead will be deposited
17. If the elementary step A to B has a reaction enthalpy of -60 KJ mol^{-1} and an activation energy of 10 KJ mol^{-1} , the activation energy of the reverse process B to A is
- A) 0 KJ mol^{-1} B) 10 KJ mol^{-1} C) 50 KJ mol^{-1} D) 70 KJ mol^{-1}
18. One mole of an ideal gas expands isothermally and reversibly from 0.02 m^3 to 0.2 m^3 at 300K . The entropy change of the system is
 (Data: $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$)
- A) zero J K^{-1} B) 83 J K^{-1} C) 19.1 J K^{-1} D) 8.3 J K^{-1}
19. Anisole reacts with a mixture of conc. sulphuric acid and nitric acid to yield
- A) *ortho* nitro anisole B) *para* nitro anisole
 C) both *ortho* and *para* nitro anisole D) *meta* nitro anisole and *ortho* anisole
20. The product of the reaction $\text{CH}_3\text{COCH}_2\text{COOC}_2\text{H}_5 \xrightarrow[\text{(ii) H}^+]{\text{(i) NaBH}_4} ?$ is
- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOC}_2\text{H}_5$ B) $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{COOC}_2\text{H}_5$
 C) $\text{CH}_3(\text{OH})\text{CH}_2\text{COOC}_2\text{H}_5$ D) $\text{CH}_3\text{CH}_2(\text{OH})\text{CH}_2\text{COOC}_2\text{H}_5$