

# Chemistry

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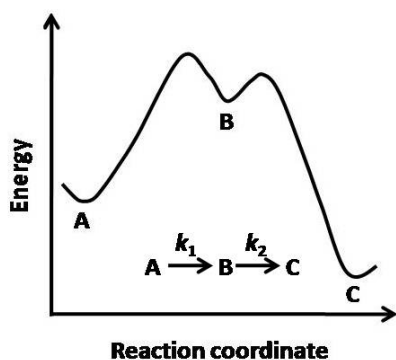
16. What is the potential of a cell containing two hydrogen electrodes, in which the anode is in contact with  $10^{-5}\text{M}$  HCl and the cathode is in contact with 1000 times the concentration of HCl as that of the anode?
- A. 0.36 V.                      B. 0.18 V.                      C.  $-0.36$  V.                      D.  $-0.18$  V.
17. Phosphorus pentoxide,  $\text{P}_4\text{O}_{10}$ , has each phosphorus linked to:
- A. 5 oxygen atoms with  $P - P$  bonds.  
B. 5 oxygen atoms.  
C. 4 oxygen atoms with  $P - P$  bonds.  
D. 4 oxygen atoms.
18. The radius of an atom of He is 0.05 nm. Assuming that one mole of a gas occupies 22.4 litres at STP, the fraction of the volume occupied by the atoms in a mole of He gas at STP is:
- A.  $1.4 \times 10^{-4}$ .                      B.  $1.4 \times 10^{-5}$ .                      C.  $7.1 \times 10^{-4}$ .                      D.  $7.1 \times 10^{-5}$ .
19. The number of degenerate orbitals present in an energy level of a  $H$ -atom characterized by  $E = -\frac{R}{16}$  where  $R$  is the Rydberg constant is:
- A. 16.                      B. 9.                      C. 4.                      D. 1.
20. Formation of ammonia in Haber's process,  $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$  ( $\Delta H = -ve$ ) can be increased by:
- A. increase in temperature and pressure.  
B. increase in temperature.  
C. increase in the concentration of ammonia.  
D. increase in pressure.
21. Choose the correct ordering for the dipole moments of the following molecules:
- A.  $\text{CO}_2 \leq \text{BF}_3 < \text{H}_2\text{O} < \text{H}_2\text{S}$ .  
B.  $\text{BF}_3 < \text{CO}_2 < \text{H}_2\text{S} < \text{H}_2\text{O}$ .  
C.  $\text{CO}_2 = \text{BF}_3 < \text{H}_2\text{S} < \text{H}_2\text{O}$ .  
D.  $\text{CO}_2 < \text{BF}_3 < \text{H}_2\text{S} < \text{H}_2\text{O}$ .
22. Which among the following complexes of Mn given below has the spin only magnetic moment ( $\mu_s$ ) value of 5.9 BM?
- A.  $[\text{Mn}(\text{CN})_6]^{4-}$   
B.  $[\text{Mn}(\text{Br})_4]^{2-}$   
C.  $[\text{Mn}(\text{en})_3]^{2+}$ ;  $\text{en} = \text{ethylenediamine}$   
D.  $\text{Mn}_2(\text{CO})_{10}$
23. Schottky as well as Frenkel defects are observed in:

- A. NaCl.                      B. ZnS.                      C. AgBr.                      D. KCl.

24. A black mineral *A* on heating in air gives a gas *B*. The mineral *A* on reaction with  $H_2SO_4$  gives a gas *C* and a compound *D*. Bubbling *C* into an aqueous solution of *B* gives white turbidity. The aqueous solution of compound *D*, on exposure to air, with  $NH_4SCN$  gives a red compound *E*. The compounds *A* and *E* respectively, are:

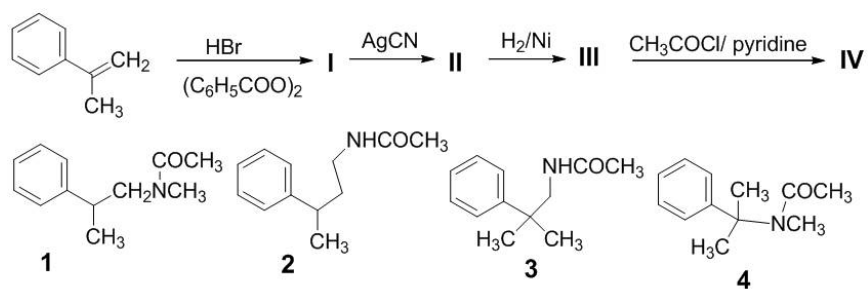
- A.  $PbS$  and  $Pb(SCN)_2$ .  
 B.  $NiS$  and  $Ni(SCN)_2$ .  
 C.  $FeS$  and  $Fe(SCN)_3$ .  
 D.  $CoS$  and  $Co(SCN)_2$ .

25. Using the diagram given below, the relation between  $k_1$  and  $k_2$  for the reaction  $A \rightarrow C$  is:



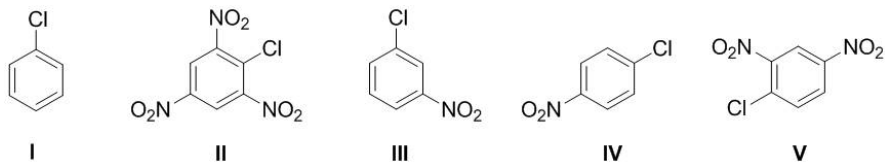
- A.  $k_1 = k_2$ .                      B.  $k_2 \ll k_1$ .                      C.  $k_1 \leq k_2$ .                      D.  $k_1 \ll k_2$ .

26. The structure of IV in the following sequence is:

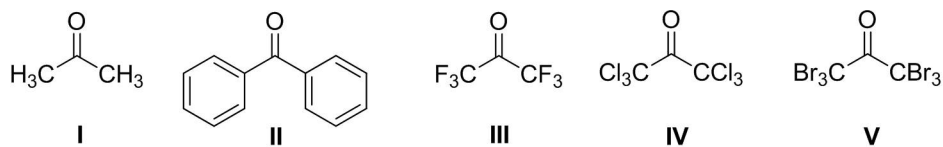


- A. 1.                      B. 2.                      C. 3.                      D. 4.

27. Arrange the following chloroarenes in increasing order of their reactivity in nucleophilic substitution to form their corresponding phenols.



- A.  $\text{II} < \text{V} < \text{III} \sim \text{IV} < \text{I}$ .  
 B.  $\text{II} < \text{V} < \text{III} < \text{I} < \text{IV}$ .  
 C.  $\text{I} \sim \text{III} < \text{IV} < \text{V} < \text{II}$ .  
 D.  $\text{I} < \text{IV} < \text{III} < \text{V} < \text{II}$ .
28. Which of the following methods is suitable for the preparation of 1,3,5-tribromobenzene from benzene?
- A. (i)  $\text{AlBr}_3/\text{Br}_2$ , light (ii) separation of isomers.  
 B. (i)  $\text{HNO}_3/\text{H}_2\text{SO}_4$  (ii)  $\text{Sn}/\text{HCl}$  (iii)  $\text{Br}_2$  (iv)  $\text{NaNO}_2/\text{HCl}$  (v)  $\text{C}_2\text{H}_5\text{OH}, \Delta$ .  
 C. (i)  $\text{HNO}_3/\text{H}_2\text{SO}_4$  (ii)  $\text{NaBH}_4$  (iii)  $\text{Br}_2/\text{CH}_3\text{COOH}$  (iv)  $\text{NaNO}_2/\text{HCl}$  (v)  $\text{H}_3\text{PO}_2$ .  
 D. (i)  $\text{HNO}_3/\text{H}_2\text{SO}_4$  (ii)  $\text{H}_2/\text{Pd}$  (iii)  $\text{NaNO}_2/\text{HCl}$  (iv)  $\text{CuBr}/\text{HBr}$ .
29. The order of reactivity of the following ketones towards nucleophilic addition of water is:



- A.  $\text{III} < \text{IV} < \text{V} < \text{I} < \text{II}$ .  
 B.  $\text{I} < \text{V} < \text{IV} < \text{III} < \text{II}$ .  
 C.  $\text{I} < \text{III} < \text{IV} < \text{V} < \text{II}$ .  
 D.  $\text{II} < \text{I} < \text{V} < \text{IV} < \text{III}$ .
30. Which among the solutions given below will not show a change in pH on dilution? (I). 0.1 M  $\text{NH}_4\text{COOCH}_3$ , (II). 0.1 M  $\text{NaCl}$ , (III). 0.1 M  $\text{NH}_4\text{OH}$ , (IV). 0.01 M  $\text{H}_2\text{SO}_4$ .
- A. I and II.                      B. I, II and IV.                      C. I and III.                      D. III and IV.