

1 Mark Questions

1. Elements exhibiting +2 oxidation state in their compounds is

- (a) Zn and P (b) Ca and Al
(c) Al and P (d) Zn and Ca

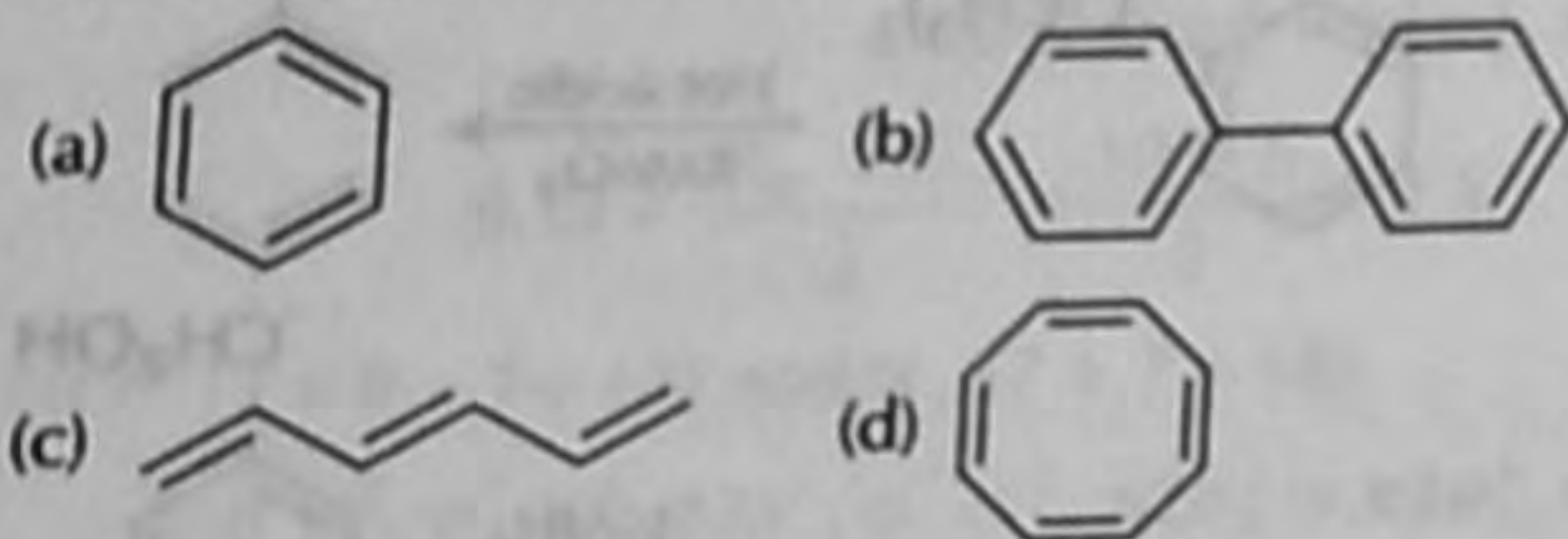
2. The paramagnetic species is

- (a) Na_2 (b) NO^+
(c) CN (d) CO

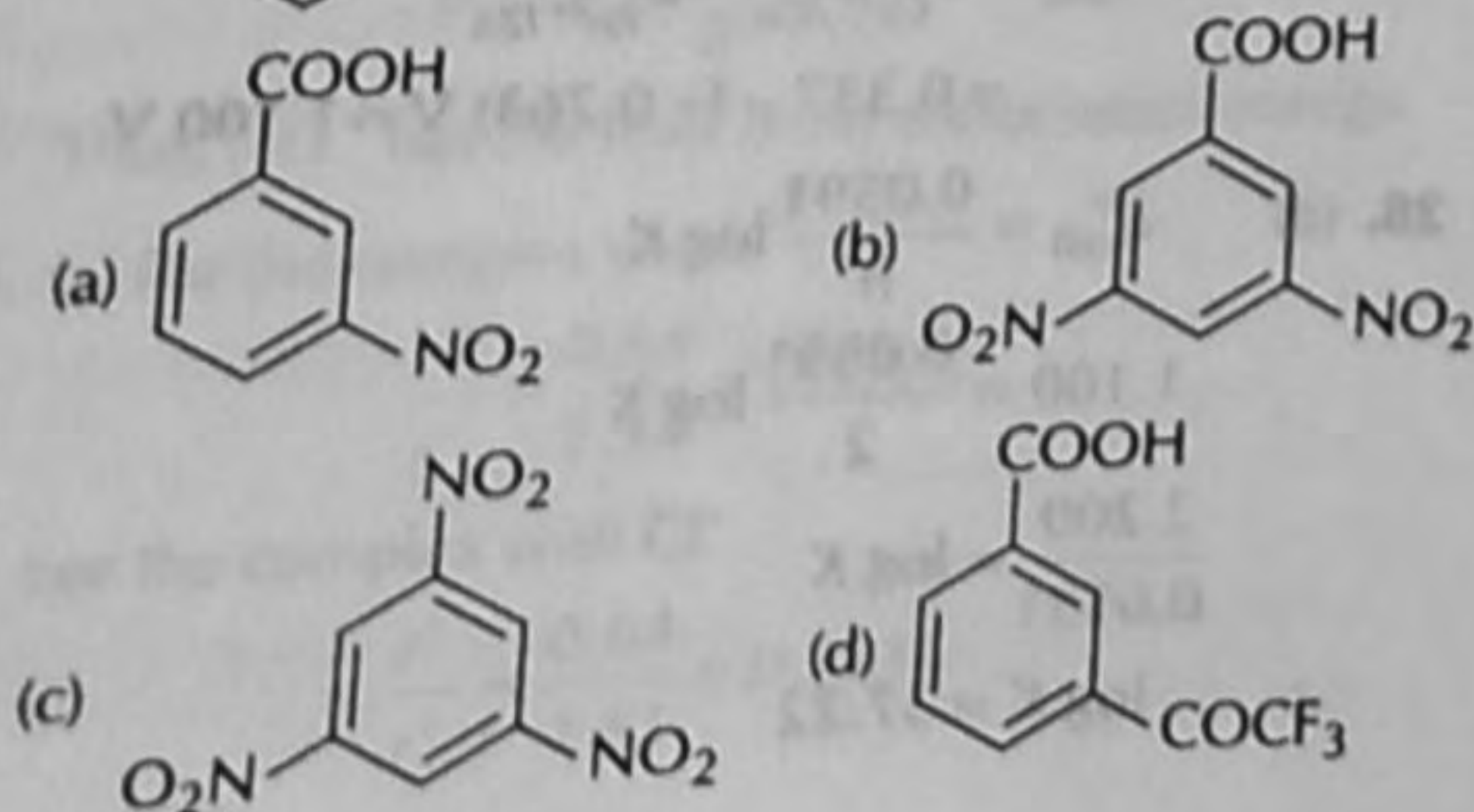
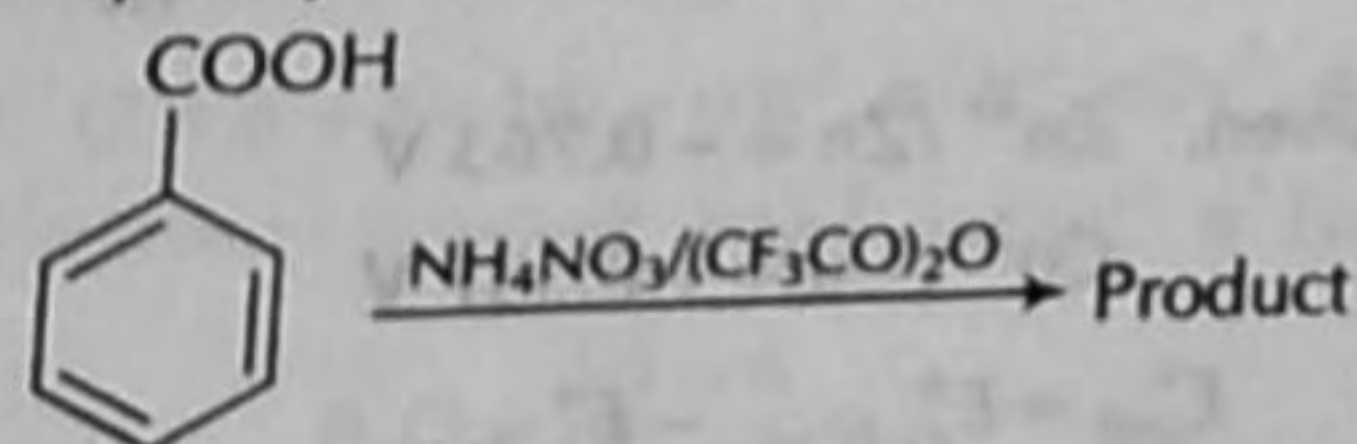
3. Hydride that readily liberates hydrogen gas on reaction with water is

- (a) NaBH_4 (b) CaH_2
(c) SiH_4 (d) NH_3

4. Which one of the following is aromatic?



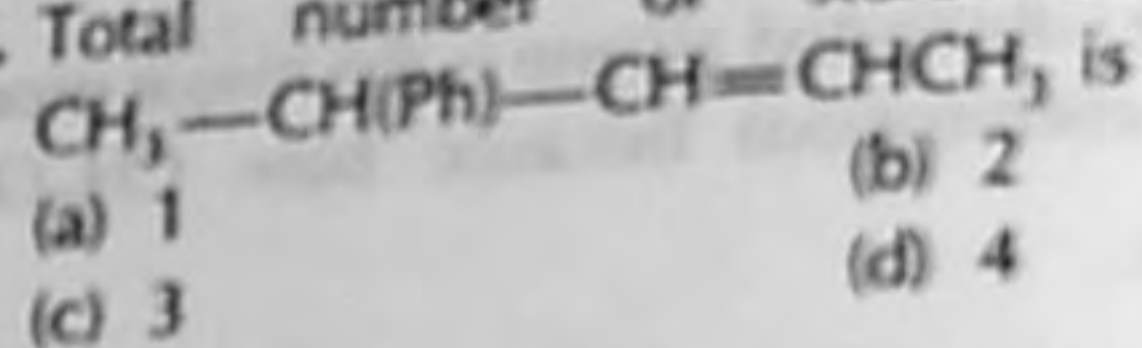
5. Identify the product of the following reaction



6. Which one of the following is most acidic?

- (a) Butanoic acid
(b) 3-chlorobutanoic acid
(c) 2-chlorobutanoic acid
(d) 4-chlorobutanoic acid

7. Total number of stereoisomers possible in



8. The standard emf of the cell, set up from the reaction $2\text{Cu}^+(\text{aq}) \longrightarrow \text{Cu}(\text{s}) + \text{Cu}^{2+}(\text{aq})$ is 0.36 V at 298 K.

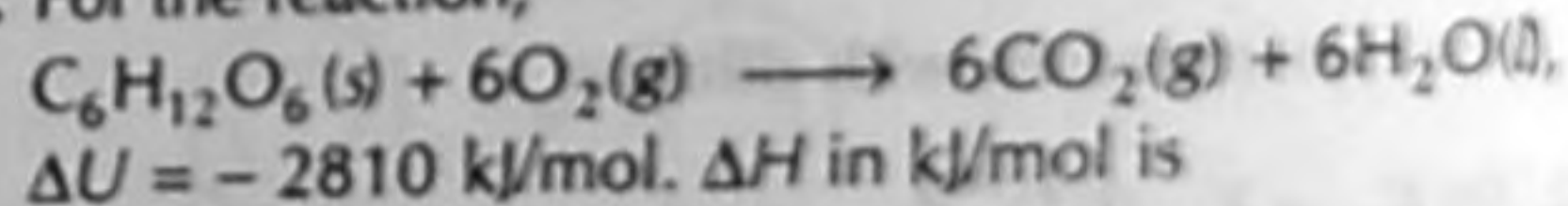
The standard Gibbs free energy in kJ/mol for this reaction is

- (a) -34.73 (b) -69.46
(c) -3473 (d) -6946

9. Heisenberg's uncertainty principle is expressed as

- (a) $\Delta p \Delta x \geq \frac{h}{2\pi}$ (b) $\Delta p \Delta x \leq \frac{h}{4\pi}$
(c) $\Delta p \Delta x \leq \frac{h}{2\pi}$ (d) $\Delta p \Delta x \geq \frac{h}{4\pi}$

10. For the reaction,



- (a) 845 (b) -890
(c) -2810 (d) -2864

2 Marks Questions

11. Which one of the following is a repeating unit of silicone?

- (a) $\text{Si}(\text{CH}_3)_4$ (b) $\text{Si}(\text{CH}_3)_2\text{O}$
(c) SiO_2 (d) $\text{Si}(\text{OCH}_3)_4$

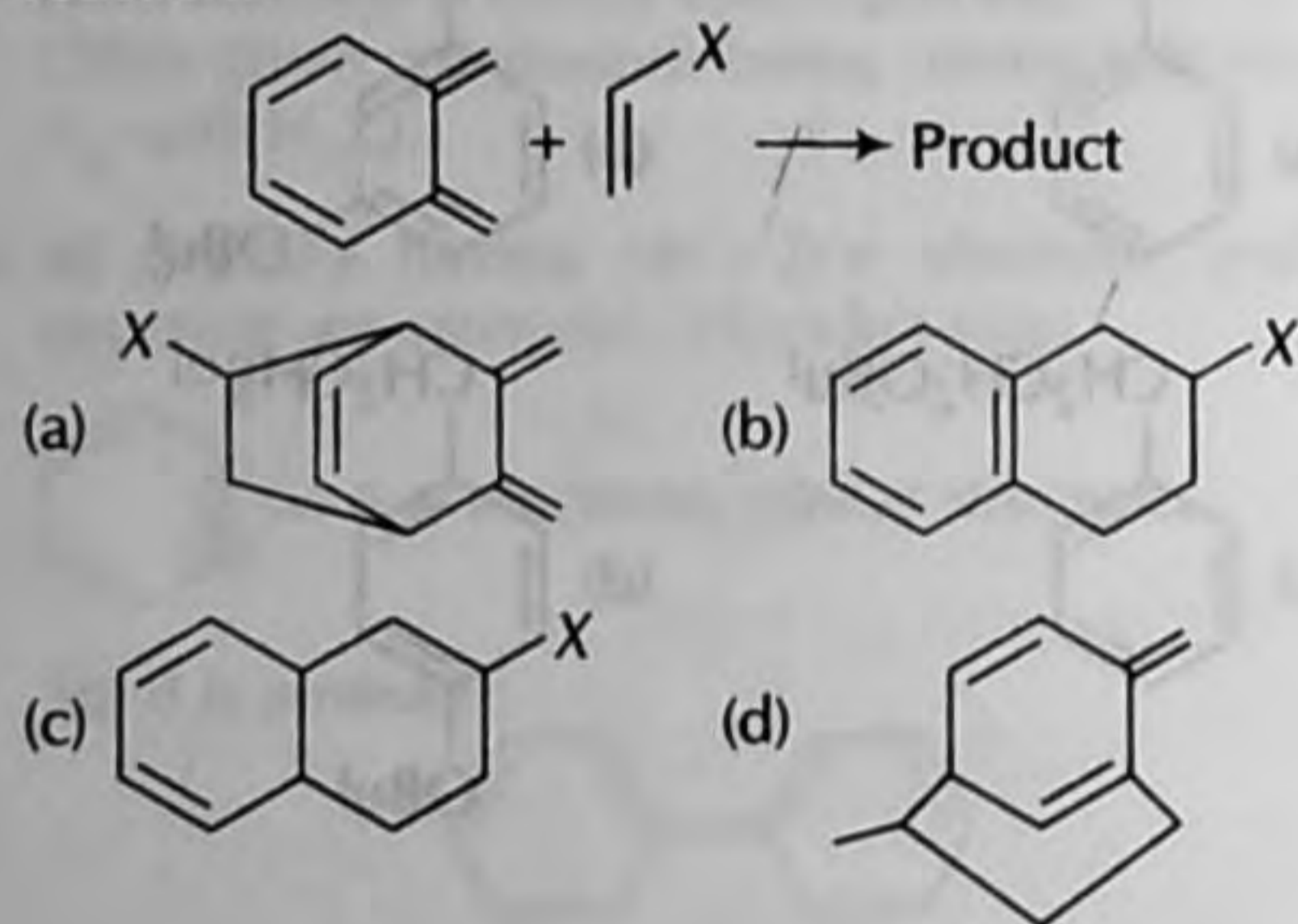
12. The order of lattice energy of NaX is $\text{NaI} < \text{NaBr} < \text{NaCl} < \text{NaF}$. The property of X / X^- responsible for the trend is

- (a) ionic radii (b) electronegativity
(c) atomic radii (d) electron affinity
13. Among BF_3 , CF_4 , PF_3 and OF_2 the molecules that are expected to have a zero dipole moment is
(a) OF_2 and CF_4 (b) BF_3 and PF_3
(c) OF_2 and PF_3 (d) BF_3 and CF_4

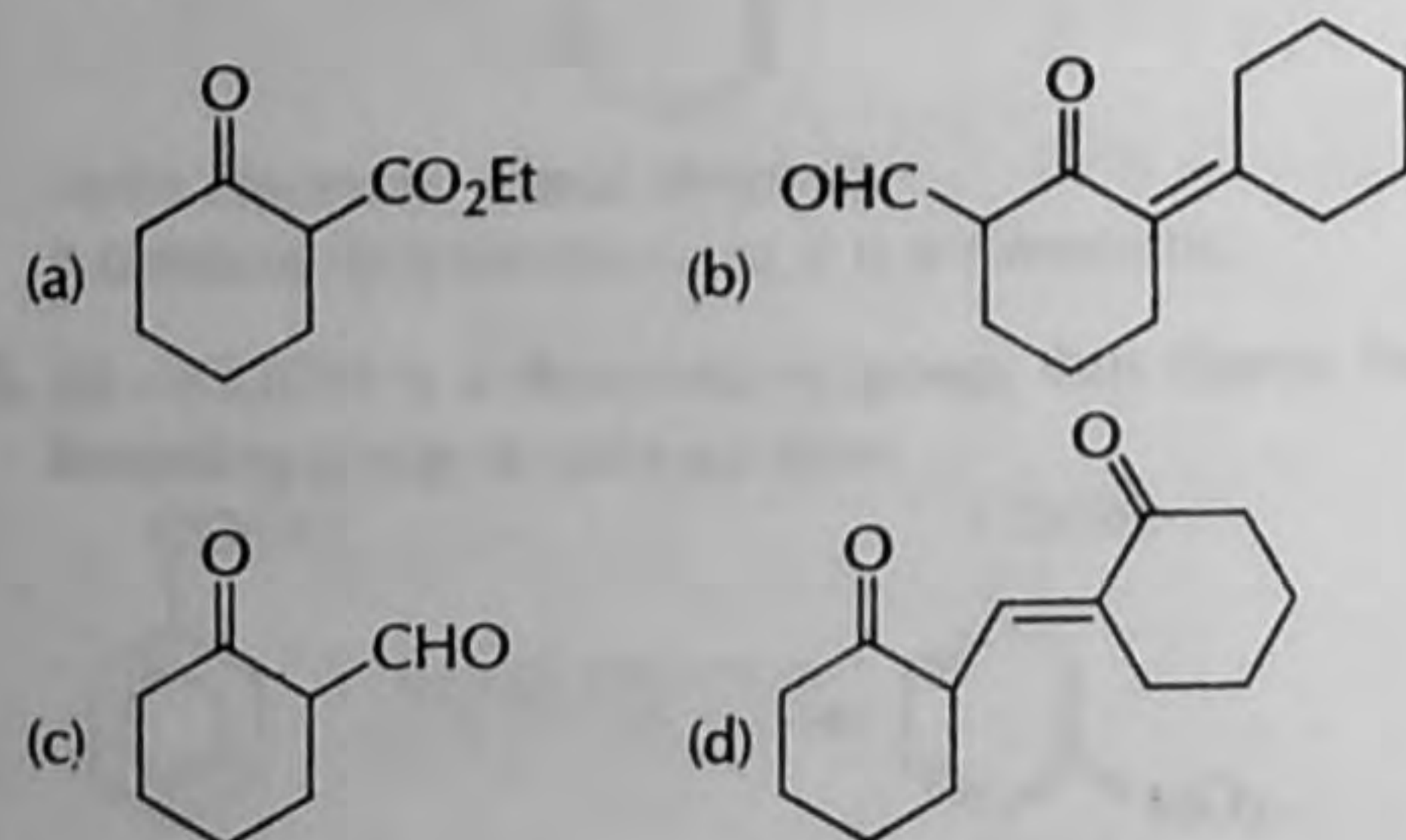
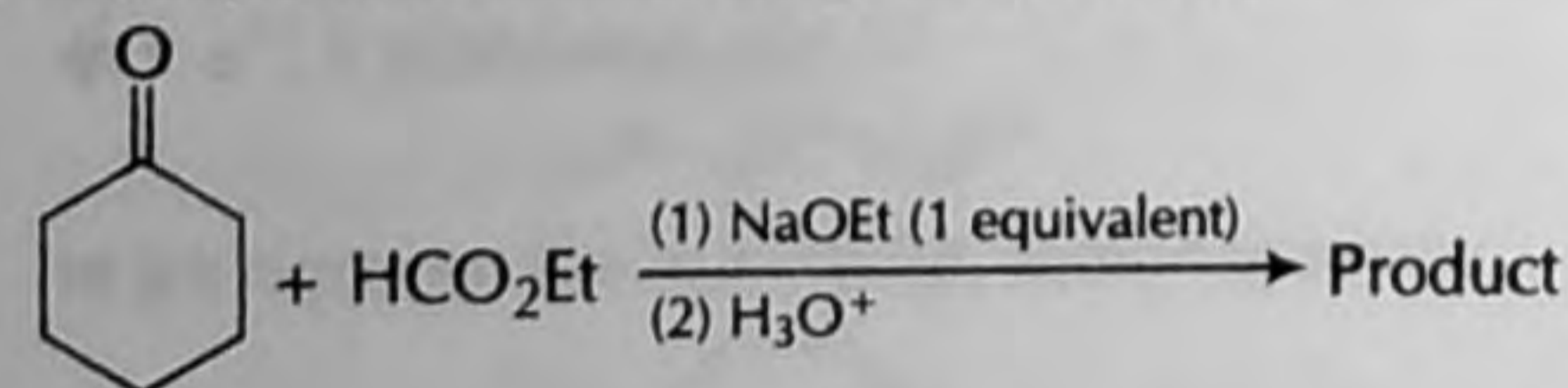
14. Air oxidation of sodium metal produces a hygroscopic compound X, which reacts with CO_2 to produce Y. X and Y respectively are
(a) Na_2O_2 and Na_2O_3 (b) Na_2O and NaHCO_3
(c) NaOH and Na_2CO_3 (d) Na_2O and Na_2CO_3

15. The product of reaction of HNO_3 with P_4 and P_4O_{10} respectively are
(a) N_2O_3 and N_2O_5 (b) N_2O_5 and NO_2
(c) NO_2 and N_2O_5 (d) NO and NO_2

16. Identify the product for the following Diels-Alder reaction.



17. Major product of reaction given below is



18. 0.050 mol of Ar initially at 25°C , expands adiabatically and reversibly from 0.50 L to 1.00 L ($C_{v,m}$ for Ar is 12.48 J/K mol). The work done in this process is
(a) 117 J (b) -69 J
(c) -138 J (d) -1378 J

19. Efficiency of a reversible cyclic heat engine working between T_c and T_h is
(a) $\frac{-T_c}{T_h}$ (b) $\frac{T_c - T_h}{T_h}$
(c) $\frac{(T_h - T_c)}{T_h}$ (d) $\frac{T_c}{T_h}$

20. To prepare one litre of an acetate buffer of 0.1 ionic strength and pH 5 at 25°C , the moles of sodium acetate and acetic acid (dissociation constant = 2.69×10^{-5}) to be added respectively are
(a) 0.1 and 0.0372 (b) 0.0372 and 0.1
(c) 0.01 and 0.372 (d) 0.372 and 0.01

21. The emf of the cell $\{\text{Pt}, \text{H}_2(1 \text{ atm}) \mid \text{HCl}(\text{aq}) \parallel \text{AgCl}, \text{Ag}\}$ is 0.332 V and the emf of AgCl/Ag electrode is 0.277 V. The pH of the solution is
(a) 0.926 (b) 1.03
(c) 3.26 (d) 5.61

22. In a saturated aqueous solution of CaF_2 , the concentrations of Ca^{2+} and F^- are $3.3 \times 10^{-4} \text{ M}$ and $6.7 \times 10^{-4} \text{ M}$ respectively. On adding NaF to this solution, if the concentration of Ca^{2+} changes to $1.5 \times 10^{-4} \text{ M}$, then molar concentration of F^- will be
(a) 1.0×10^{-8} (b) 1.0×10^{-6}
(c) 1.0×10^{-4} (d) 1.0×10^{-3}

Common Data for Questions 23 and 24

Reaction $A + B \longrightarrow \text{Products}$

23. When the reaction is first order in A and zero order in B, rate constant is
(a) $\{-1/(t[A]_0)\} \ln ([A]_0/[A]_t)$
(b) $(-1/t) \ln ([A]_0/[A]_t)$
(c) $(1/t) \ln ([A]_0/[A]_t)$
(d) $\{1/(t[A]_0)\} \ln ([A]_0/[A]_t)$
24. When the reaction is second order in A and zero order in B, rate constant is
(a) $(1/t) \{([A]_t - [A]_0)/([A]_0[A]_t)\}$
(b) $(1/t) \{(1/[A]_t) - (1/[A]_0)\}$
(c) $\{[1/(t[A]_0)]\} \{([A]_t - [A]_0)/([A]_0[A]_t)\}$
(d) $\{1/t[A]_0\} \{(1/[A]_t) - (1/[A]_0)\}$

Common Data for Questions 25 and 26

3,3-dimethyl-1-butene ($\text{Me}_3\text{C}-\text{CH}=\text{CH}_2$) on reaction with

25. Hydrochloric acid produces a halogenated compound as major product. The product is

- (a) $\text{Me}_3\text{C}-\text{CH}(\text{Cl})-\text{CH}_3$
 (b) $\text{Me}_3\text{C}-\text{CH}_2-\text{CH}_2\text{Cl}$
 (c) $\text{Me}_2\text{C}(\text{Cl})-\text{CHMe}_2$
 (d) $\text{Me}_2\text{C}(\text{Cl})-\text{CH}_2\text{CH}_2\text{CH}_3$

26. $\text{Hg}(\text{OCOCH}_3)_2$ followed by treatment with alkaline NaBH_4 produces

- (a) $\text{Me}_2\text{C}(\text{OH})-\text{CHMe}_2$
 (b) $\text{Me}_2\text{C}(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_3$
 (c) $\text{Me}_3\text{C}-\text{CH}_2-\text{CH}_2\text{OH}$
 (d) $\text{Me}_3\text{C}-\text{CH}(\text{OH})-\text{CH}_3$

Statement for Linked Answer Questions 27 and 28

A pink coloured aqueous solution of CoCl_2 changes immediately to blue on adding excess of Cl^- ion.

27. The blue coloured species is

- (a) $[\text{CoCl}_6]^{3-}$ (b) $[\text{CoCl}_4]^{2-}$
 (c) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ (d) $[\text{CoCl}_4]^-$

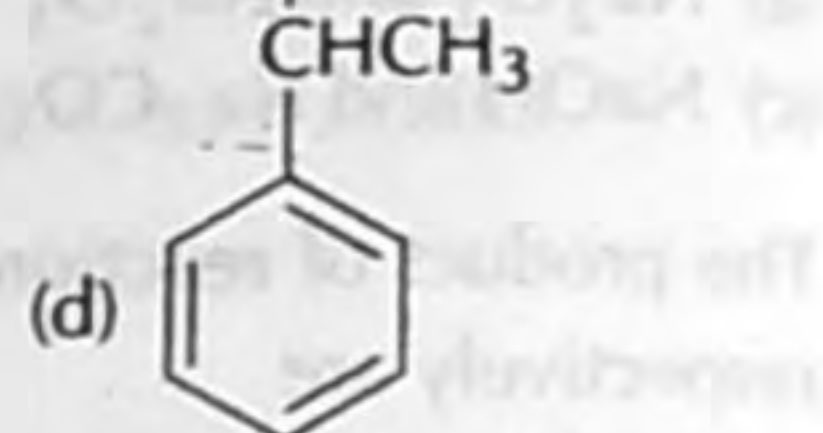
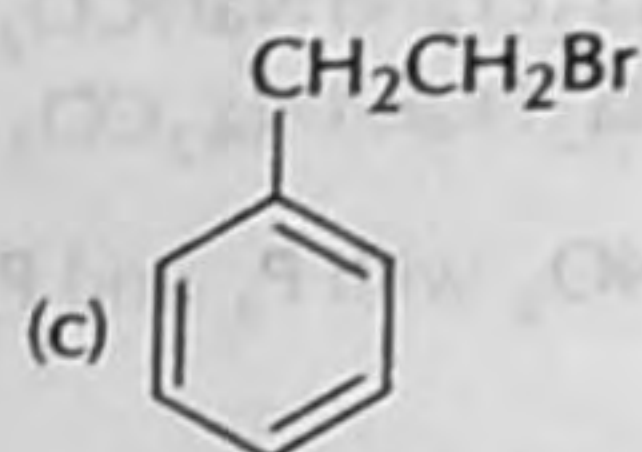
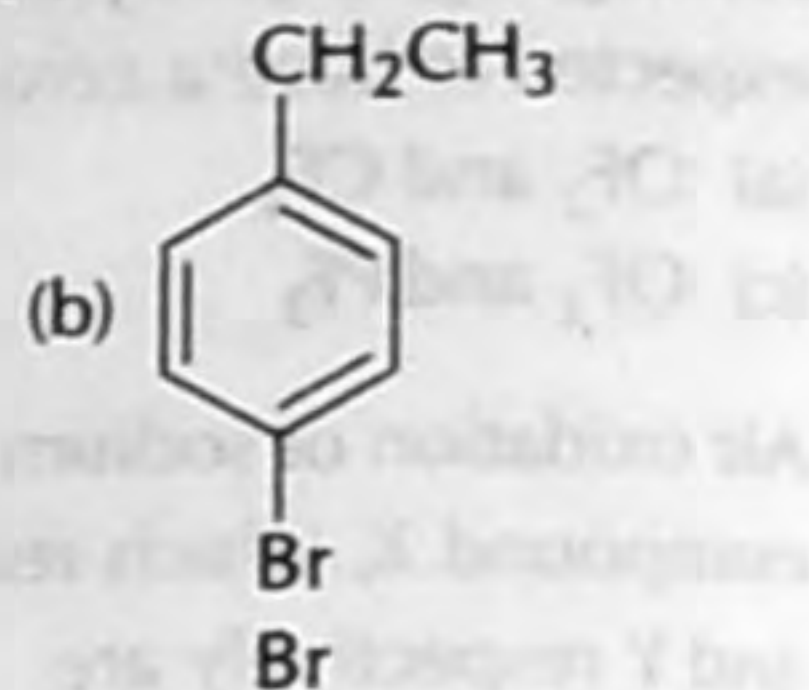
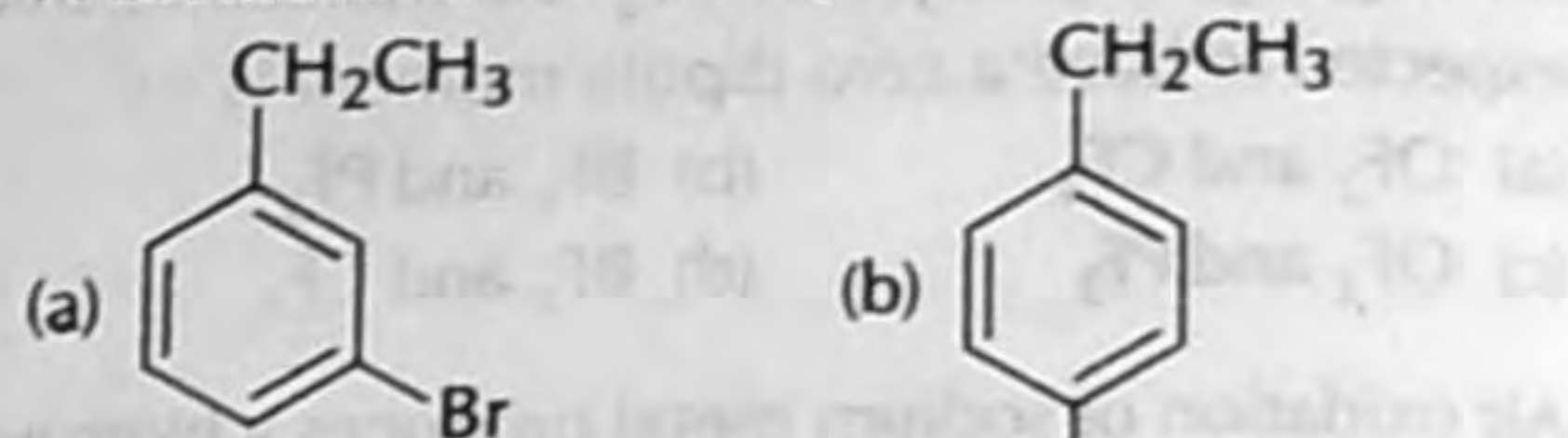
28. The *d*-electron configuration for the blue complex ion is

- (a) $e^3 t_{2g}^3$ (b) $t_{2g}^5 e_g^2$
 (c) $t_{2g}^4 e_g^2$ (d) $e^4 t_{2g}^3$

Statement for Linked Answer Questions 29 and 30

Ethylbenzene reacts with

29. N-bromosuccinimide to produce a compound X. X is



30. X on treatment with *t*-BuOK in butanol provides Y. The product Y is

