

1. Find total number of electrons in p-orbitals of vanadium (Z = 23)

Ans. (12)

Sol. ${}_{23}\text{V} = 1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$

2. Identify the correct sequence of hybridization of following species

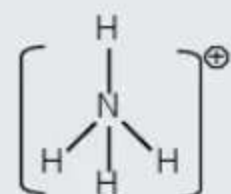
NH_4^+ , NO_2^+ , SF_4 , IF_5

(1) sp^3 , sp , sp^3d , sp^3d^2

(3) sp^3 , sp , sp^3d , sp^3d

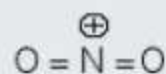
Ans. (1)

Sol. NH_4^+



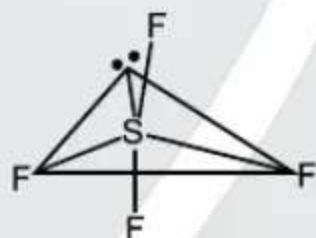
sp^3

NO_2^+



sp

SF_4



sp^3d

IF_5



sp^3d^2

(2) sp , sp^2 , sp^3 , sp^3d

(4) sp^3 , sp^2 , sp^3d , sp^3d^2

3. Identify the incorrect statement regarding Mendeleev.

(1) He is the writer of chemistry book. i.e., 'principles of chemistry'

(2) Mendeleev proposed the periodic table when structure of atoms were unknown

(3) Atomic number 101 element named after Mendeleev

(4) Mendeleev developed accurate parameters

4. Identify the correct set which is paramagnetic and coloured.

- (1) Cu^{2+} , Sc^+ , Cr^{3+} (2) Mn^{7+} , Cr^{3+} , Hg^{2+}
 (3) Cu^+ , Sc^{3+} , Co^+ (4) Mn^{7+} , Cu^+ , Cr^{3+}

Ans. (1)

Sol.

Ion	No. of unpaired e^-
Cu^{2+}	1
Sc^+	2
Cr^{3+}	3

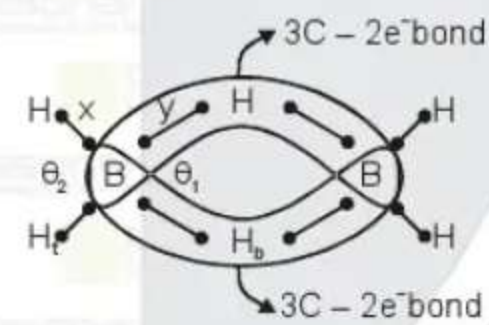
Ion	No. of unpaired e^-
Cu^{2+}	1
Sc^+	2
Cr^{3+}	3

This set is "paramagnetic & coloured"

5. Identify the correct statement regarding diborane (B_2H_6)

- (1) Hybridisation of boron is sp^2 (2) It contains one 3 center- 2 electron bond.
 (3) It is a planar molecule (4) NaBH_4 on oxidation with I_2 gives B_2H_6

Ans. (4)



6. K_p for the reaction $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$ at 288 K is 47.9, then value of K_c is -

[Report your answer to nearest integer]

[Given $R = 0.083 \text{ bar lit / mole K}$]

Ans. (2)

Sol. $K_p = K_c(RT)^{\Delta n_g}$

$47.9 = K_c (0.083 \times 288)^1$

$K_c = 2$

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8. Isotopes of hydrogen which emits low energy β^- particle with half life greater than 12 year is :
(1) Tritium and Deuterium (2) Deuterium
(3*) Tritium (4) Protium

Sol. Only tritium is radioactive and emits low energy β particles ($t_{1/2}$, 12.33 years)

9. The concentration of glucose ($C_6H_{12}O_6$) in blood is 0.72 gram/lit, the molarity of glucose is $[x] \times 10^{-3}$ M, then value of x is

Ans. (4)

Sol.
$$M = \frac{W_{\text{solute}}}{M_{\text{solute}} \times V_{\text{soln}}(\text{in lit})}$$
$$= \frac{0.72}{180}$$
$$= 0.004 = 4 \times 10^{-3}$$

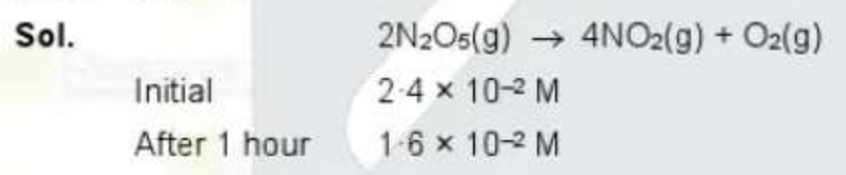
10. 0.05 M solution of which compound have lowest freezing point
(1) K_2SO_4 (2) KI (3) $C_6H_{12}O_6$ (4) $Al_2(SO_4)_3$

Ans. (4)

Sol. $\Delta T_f = i K_f m$
Greater the i value lower will be freezing point

11. N_2O_5 dissociate according to 1st order kinetic as $(2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g))$. kinetics initial concentration of N_2O_5 is 2.4×10^{-2} M and concentration of N_2O_5 after 1 hour is 1.6×10^{-2} M, then the rate constant k in min^{-1} for this dissociation is $[x] \times 10^{-5} \text{min}^{-1}$, then x is.

Ans. 346



$$t = \frac{1}{2k} \ln \left(\frac{a}{a-x} \right)$$

$$2.303 = \frac{1}{2k} \ln \left(\frac{2.4 \times 10^{-2}}{1.6 \times 10^{-2}} \right)$$

Sol. $\Delta T_f = i K_f m$

Greater the i value lower will be freezing point

11. N_2O_5 dissociate according to 1st order kinetic as $(2\text{N}_2\text{O}_5(\text{g}) \rightarrow 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g}))$. kinetics initial concentration of N_2O_5 is 2.4×10^{-2} M and concentration of N_2O_5 after 1 hour is 1.6×10^{-2} M, then the rate constant k in min^{-1} for this dissociation is $[x] \times 10^{-5} \text{min}^{-1}$, then x is.

Ans. 346

Sol. $2\text{N}_2\text{O}_5(\text{g}) \rightarrow 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$

Initial 2.4×10^{-2} M

After 1 hour 1.6×10^{-2} M

$$t = \frac{1}{2k} \ln \left(\frac{a}{a-x} \right)$$

$$k = \frac{2.303}{2 \times 60} \log \left(\frac{2.4 \times 10^{-2}}{1.6 \times 10^{-2}} \right)$$

$$k = \frac{2.303}{2 \times 60} \log \left(\frac{3}{2} \right)$$

$$= \frac{2.303}{2 \times 60} \times [0.48 - 0.30]$$

$$= 0.00346$$






$$= 346 \times 10^{-5} \text{min}^{-1}$$

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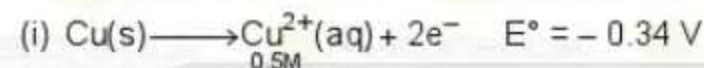
12. Oxygen is maximum soluble in

- (1) Water at 4°C (2) Water at 80°C (3) Polluted water (4) Boiling water

Ans. (1)

Sol. Solubility of oxygen is increase with decrease in temperature.

13. Using the following cell reaction find cell



$$[\text{Given } \log 2.5 = 0.4] \quad \frac{2.303RT}{F} = 0.06$$

Report your answer as $[E_{\text{cell}}] \times 10^{-3}$.

Ans. (448)

$$\text{Sol. } E^{\circ}_{\text{cell}} = (E^{\circ}_{\text{RP}})_{\text{C}} - (E^{\circ}_{\text{RP}})_{\text{A}}$$

$$= 0.80 - 0.34 = 0.46 \text{ V}$$

$$E_{\text{cell}} = E^{\circ}_{\text{cell}} - \frac{0.06}{2} \log \frac{[\text{Cu}^{2+}]}{[\text{Ag}^{+}]^2} = 0.46 - \frac{0.06}{2} \log \left\{ \frac{0.5}{(0.45)^2} \right\}$$

$$= 0.46 - \frac{0.06}{2} \log 2.5 = 0.46 - \frac{0.06}{2} \times 2.5$$

$$= 0.46 - 0.012 = 0.448 = 448 \times 10^{-3}$$

14. Match column-I with Column-II

Column-I

- (a) Li
- (b) Na
- (c) Ca
- (d) Ba

Column-II

- (i) soluble in organic compound
- (ii) outer electronic configuration is $6s^2$
- (iii) oxalate is not soluble in aqueous solution
- (iv) form strong monobasic compound

$$= 0.80 - 0.34 = 0.46V$$

$$E_{\text{cell}} = E^{\circ}_{\text{cell}} - \frac{0.06}{2} \log \frac{[\text{Cu}^{2+}]}{[\text{Ag}^{+}]^2} = 0.46 - \frac{0.06}{2} \log \left\{ \frac{0.5}{(0.45)^2} \right\}$$

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$$= 0.46 - 0.012 = 0.448 = 448 \times 10^{-3}$$

14. Match column-I with Column-II

Column-I

(a) Li

(b) Na

(c) Ca

(d) Ba

(1*) a-i, b-iv, c-iii, d-ii

(3) a-iii, b-iv, c-i, d-ii

Column-II

(i) soluble in organic compound

(ii) outer electronic configuration is $6s^2$

(iii) oxalate is not soluble in aqueous solution

(iv) form strong monobasic compound

(2) a-i, b-ii, c-iii, d-iv

(4) a-i, b-iv, c-iii, d-ii

Ans. (1)

15. Find the sum of magnetic moment (spin only) of following ion Co^+ , Zn^{2+} , V^{5+}

[Report your answer to nearest integer]

Ans. 5

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16. Which of the following have strong reducing power
(1) PH_3 (2) BiH_3 (3) AsH_3 (4) SbH_3

Ans. (2)

Sol. NH_3
 PH_3
 AsH_3
 SbH_3
 BiH_3

As we move down the group reducing power is increase.

17. When AgNO_3 solution is added to KI , the sol produced is
(1) KI/NO_3^- (2*) AgI/Ag^+ (3) AgI/I^- (4) $\text{AgNO}_3/\text{NO}_3^-$

Sol. $\text{AgNO}_3 + \text{KI} \rightarrow \text{AgI} \left| \text{Ag}^+ \right.$

18. How much heat is released on (in kJ) of 10 gram graphite
[Given $\Delta H_{\text{combustion}}(\text{graphite}) = -2.48 \text{ kJ/mol}$]
[Report your answer to nearest integer]

Ans. 2

Sol. $\text{C}(\text{graphite}) + \text{O}_2 \rightarrow \text{CO}_2(\text{g}) \Delta H = -2.48 \text{ kJ mole } \frac{10}{12} \text{ mole}$

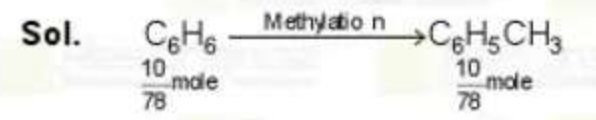
Total heat released = $2.48 \times \frac{10}{12} = 1.90 \text{ kJ}$

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19. 10 gram Benzene (GMM = 78) on methylation give 9.2 gram of Toluene (GMM = 92), then percentage yield of process is :

Ans. 78.00



$$(W_{\text{theoretical}}) = \frac{10}{78} \times 92$$

$$\% \text{ yield} = \frac{W_{\text{actual}}}{W_{\text{theoretical}}} \times 100$$

$$= \left[\frac{9.2}{10 \times 92} \times 78 \right] \times 100 = 78\%$$

20. The total number of isomers of square planar complex $[\text{MFCI}(\text{SCN})(\text{NO}_2)]$ is

- (1) 12 (2) 6 (3) 8 (4) 4

Ans. (1)

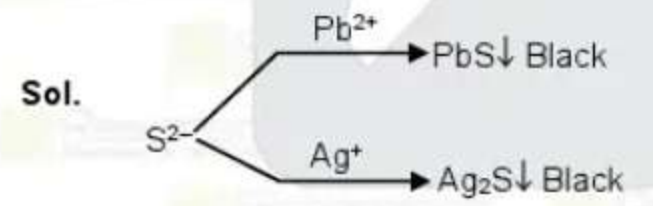
- Sol.** SCN/NO₂ – 3 arrangements
NCS/NO₂ – 3 arrangements
SCN/ONO – 3 arrangements
NCS/ONO – 3 arrangements

Total number of isomers = 12

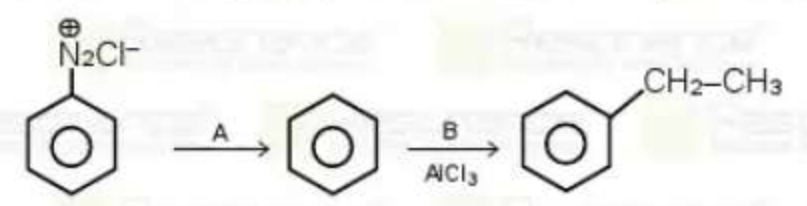
21. Consider sulphide ion $[\text{S}^{2-} \text{ ion}]$ as a soft base. Which of the following ion will form sulphide **[36 T]**

- (1) Pb²⁺, Ag⁺ (2) Ag⁺, Mg²⁺ (3) Al³⁺, Ag⁺ (4) Al³⁺, Mg²⁺

Ans. (3)



22. In the following sequence of reactions identify A & B respectively. [OC, Aromatic, Al, M]



- (1) H_3PO_2 CH_3-CH_2-Cl (2) H_3PO_2 CH_3-CH_2-OH
 (3) CH_3-CH_2-OH H_3PO_2 (4) CH_3-CH_2-Cl H_3PO_2

Ans. (1)

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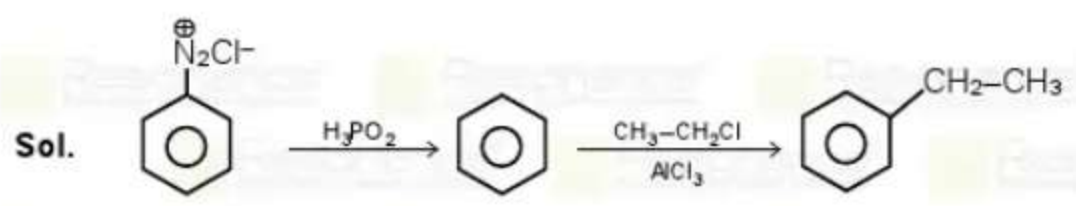
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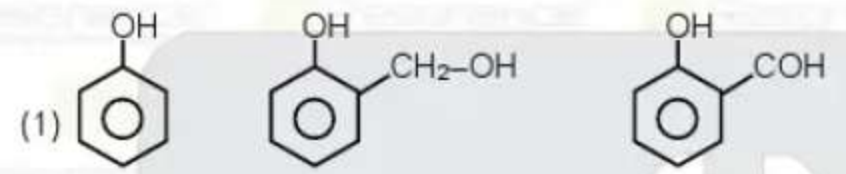
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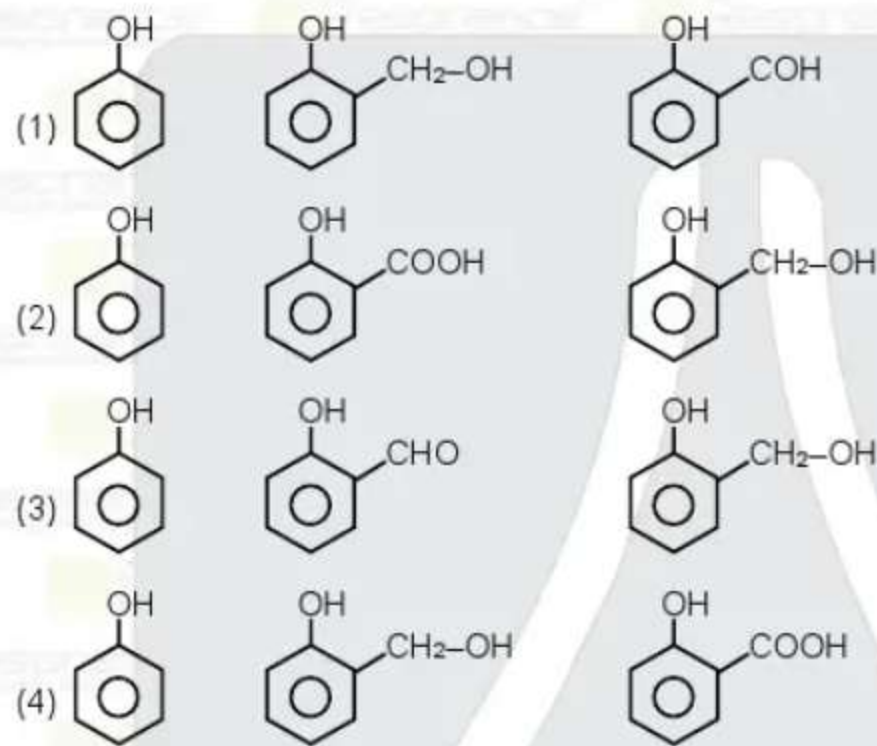
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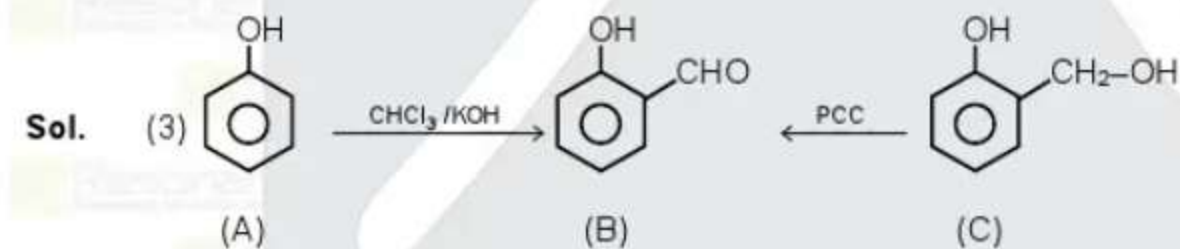
23. A (C_6H_6O) gives dark green colouration with $FeCl_3$. A on reaction with $CHCl_3, KOH$ gives B. B can also be prepared from C by PCC. The correct option for A, B and C is :



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Ans. (3)

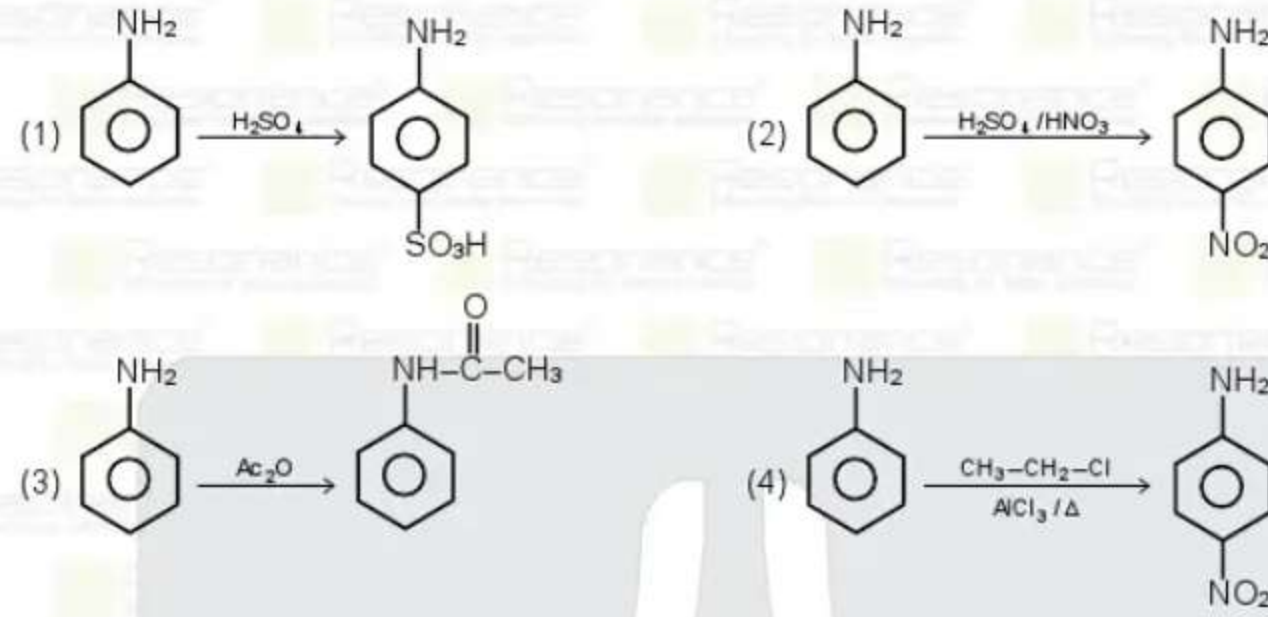


24. Which of the following does not show resonance.



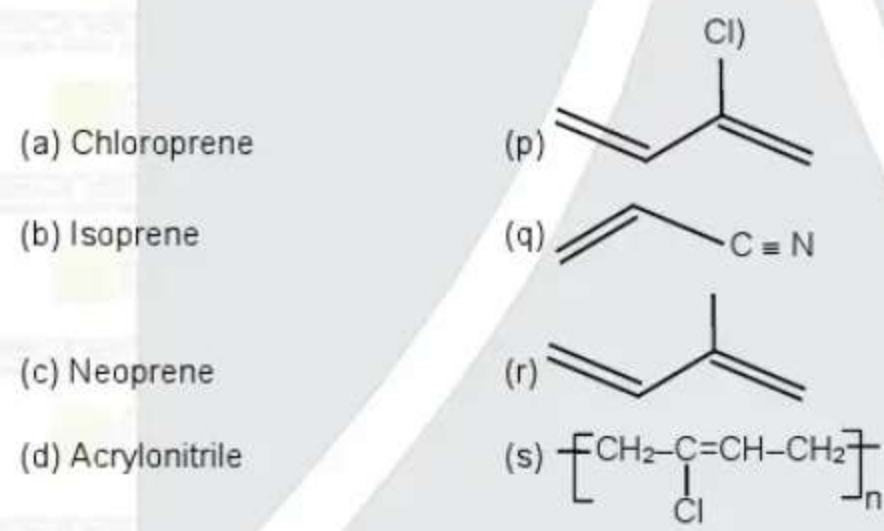
Ans. (3)

25. Which of the following reaction is not possible :



Sol. Friedel-craft alkylation is not possible in aniline due to formation of highly deactivated cationic salt.

26. Match the following :



Ans. (1*) (a) → (p), (b) → (r), (c) → (s), (d) → (q) (2) (a) → (r), (b) → (s), (c) → (p), (d) → (q)

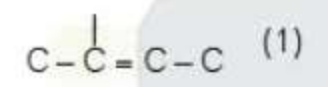
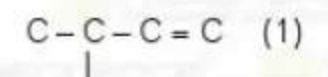
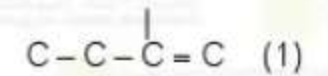
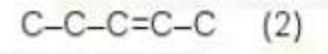
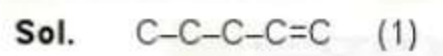
(3) (a) → (r), (b) → (p), (c) → (q), (d) → (s) (4) (a) → (q), (b) → (r), (c) → (p), (d) → (s)

Sol. NCERT

27. Which of the following does not show stereoisomerism

28. Total acyclic number of structures including geometrical of pentene is

Ans. 6



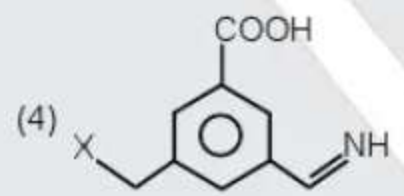
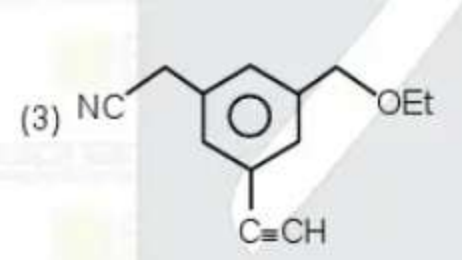
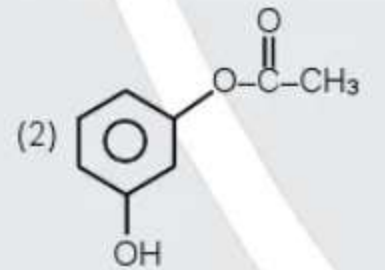
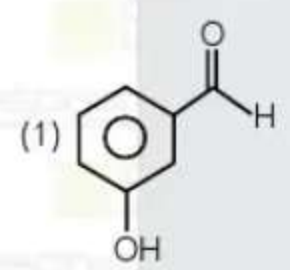
29. Thiamin & pyridoxine vitamin are respectively :

- (1) B₁ & B₆ (2) B₂ & E (3) B₁ & E (4) E₁ & B₆

Ans. (1)

Sol. NCERT

30. Which of the following give tertiary alcohol with excess Grignard reagent (CH₃MgBr)



Ans. (2)