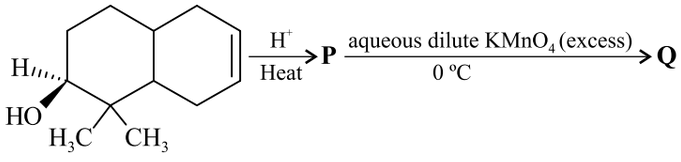
JEE Advanced 2015: Paper–II
(Model Solutions)

SECTION I

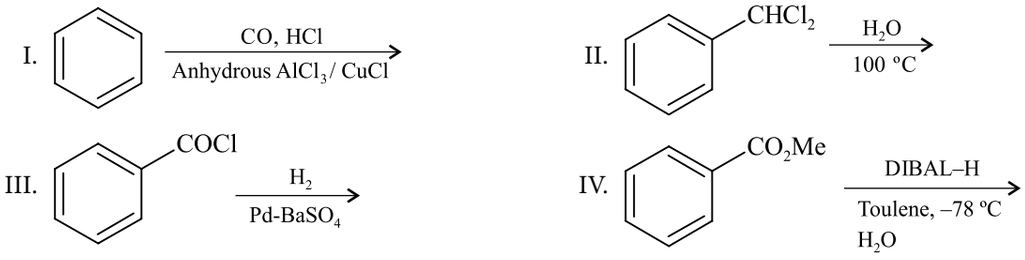
(Single Digit Integer Type)

This section contains **EIGHT** questions.
This answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive

1. The number of hydroxyl group(s) in **Q** is



2. Among the following, the number of reaction(s) that produce(s) benzaldehyde is



3. In the complex acetylbromidodicarbonylbis(triethylphosphine)iron(II), the number of Fe–C bond(s) is _____.

4. Among the complex ions, $[Co(NH_2CH_2CH_2NH_2)_2Cl_2]^+$, $[CrCl_2(C_2O_4)_2]^{3-}$, $[Fe(H_2O)_4(OH)_2]^+$, $[Fe(NH_3)_2(CN)_4]^-$, $[Co(NH_2CH_2CH_2NH_2)_2(NH_3)Cl]^{2+}$ and $[Co(NH_3)_4(H_2O)Cl]^{2+}$, the number of complex ion(s) that show(s) *cis-trans* isomerism is _____.

5. Three moles of B_2H_6 are completely reacted with methanol. The number of moles of boron containing products formed is _____.

6. The molar conductivity of a solution of a weak acid HX (0.01 M) is 10 times smaller than the molar conductivity of a solution of a weak acid HY (0.10 M). If $\lambda^{\infty}_{X^-} \approx \lambda^{\infty}_{Y^-}$, the difference in their pK_a values, pK_a (HX) – pK_a (HY), is _____ . (Consider degree of ionization of both acids to be << 1)

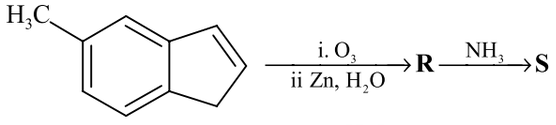
7. A closed vessel with rigid walls contains 1 mol of $^{238}_{92}U$ and 1 mol of air at 298 K. Considering complete decay of $^{238}_{92}U$ to $^{206}_{82}Pb$, the ratio of the final pressure to the initial pressure of the system at 298 K is _____.

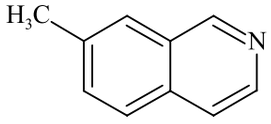
8. In dilute aqueous H_2SO_4, the complex diaquodioxalatoferrate(II) is oxidized by MnO_4^-. For this reaction, the ratio of the rate of change of $[H^+]$ to the rate of change of $[MnO_4^-]$ is _____.

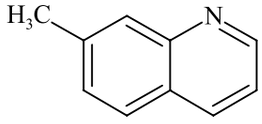
SECTION II
(One or More than One Options Correct Type)

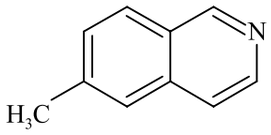
This section contains **EIGHT** questions
Each question has **FOUR** options (a), (b), (c) and (d). **ONE OR MORE THAN ONE** of these four options(s) is (are) correct

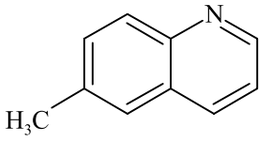
9. In the following reactions, the product **S** is



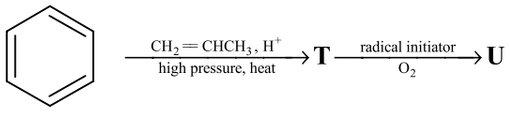
(a) 

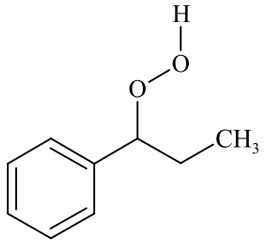
(b) 

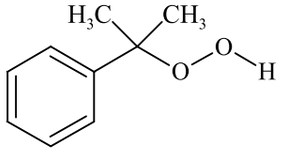
(c) 

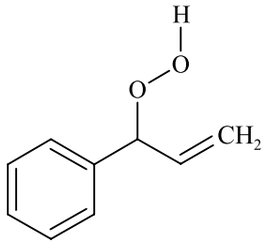
(d) 

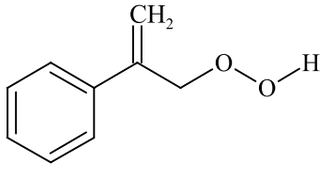
10. The major product **U** in the following reactions is



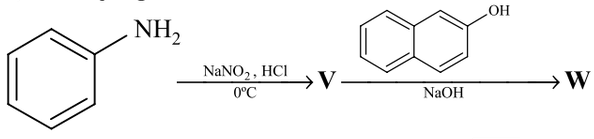
(a) 

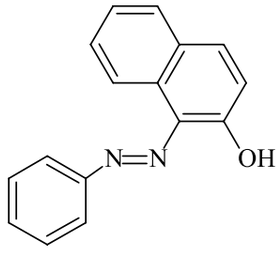
(b) 

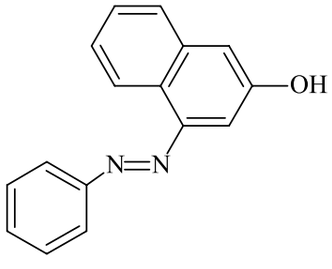
(c) 

(d) 

11. In the following reactions, the major product **W** is

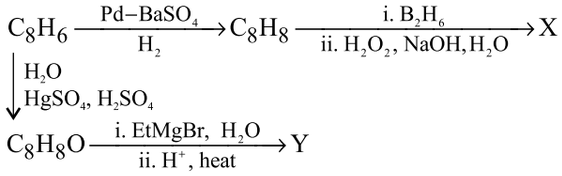


(a) 

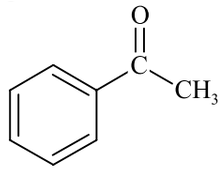
(b) 

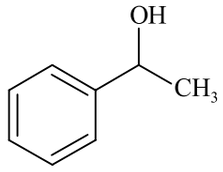
Passage-1

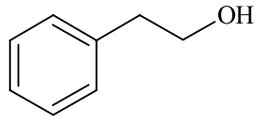
In the following reactions

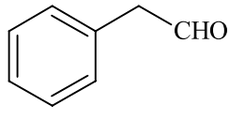


17. Compound **X** is

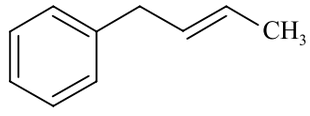
(a) 

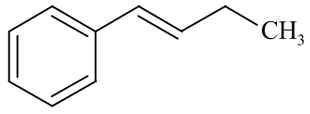
(b) 

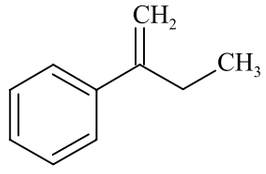
(c) 

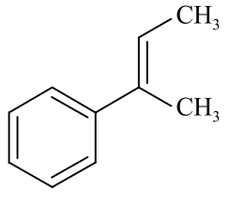
(d) 

18. The major compound **Y** is

(a) 

(b) 

(c) 

(d) 

Passage-2

When 100 mL of 1.0 M HCl was mixed with 100 mL of 1.0 M NaOH in an insulated beaker at constant pressure, a temperature increase of 5.7 °C was measured for the beaker and its contents **(Expt. 1).** Because the enthalpy of neutralization of a strong acid with a strong base is a constant (–57.0 kJ mol^{-1}), this experiment could be used to measure the calorimeter constant.

In a second experiment **(Expt. 2)**, 100 mL of 2.0 M acetic acid ($K_a = 2.0 \times 10^{-5}$) was mixed with 100 mL of 1.0 M NaOH (under identical conditions to **Expt. 1)** where a temperature rise of 5.6 °C was measured. (Consider heat capacity of all solutions as 4.2 J g^{-1} K^{-1} and density of all solutions as 1.0 g mL^{-1})

19. Enthalpy of dissociation (in kJ mol^{-1}) of acetic acid obtained from the **Expt. 2** is

(a) 1.0 (b) 10.0 (c) 24.5 (d) 51.4

20. The pH of the solution after **Expt. 2** is

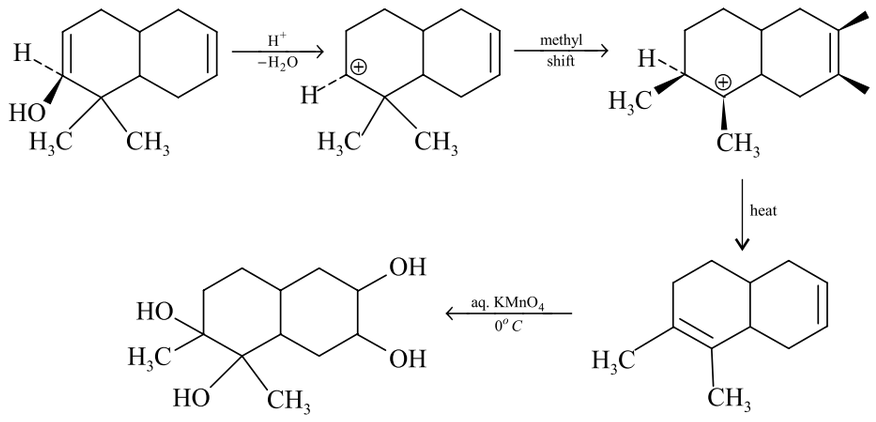
(a) 2.8 (b) 4.7 (c) 5.0 (d) 7.0

ANSWERS

1. (4)	**2.** (4)	**3.** (3)	**4.** (6)	**5.** (6)
6. (3)	**7.** (9)	**8.** (8)	**9.** (a)	**10.** (b)
11. (a)	**12.** (b), (c)	**13.** (c), (d)	**14.** (b)	**15.** (b), (c), (d)
16. (c)	**17.** (c)	**18.** (d)	**19.** (a)	**20.** (b)

Solutions

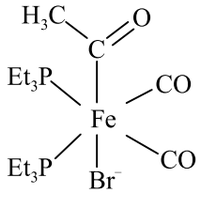
1.



There are **4** hydroxyl groups.

2. In all the **four** reactions, benzaldehyde is produced.

3. The given complex is



The number of Fe—C bonds is **three.**

4.

Complex	Type	*cis-trans* Isomerism
$[Co(NH_2CH_2CH_2NH_2)_2Cl_2]^+$	$M(A–A)_2a_2$	Yes
$[CrCl_2(C_2O_4)_2]^{3-}$	$M(A–A)_2a_2$	Yes
$[Fe(H_2O)_4(OH)_2]^+$	Ma_4b_2	Yes
$[Fe(NH_3)_2(CN)_4]^-$	Ma_4b_2	Yes
$[Co(NH_2CH_2CH_2NH_2)_2[NH_3]Cl]^{2+}$	$M(A–A)_2ab$	Yes
$[Co(NH_3)_4(H_2O)Cl]^{2+}$	Ma_4bc	Yes