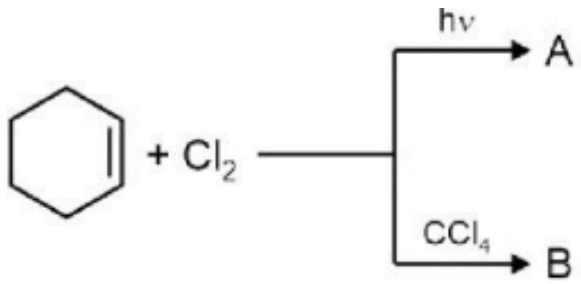
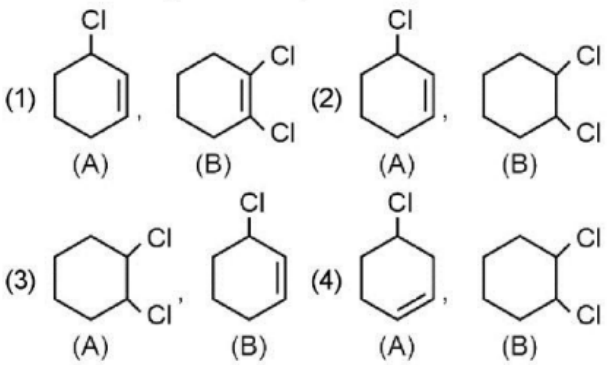
JEE Main 2024 Chemistry Question Paper Jan 29 Shift 1

1. Which of the following pairs will be formed by the decomposition of $KMnO_4$?

(1) $KMnO_4$, MnO_2
(2) K_2MnO_4, MnO_2
(3) K_4MnO_4, H_2O
(4) MnO_2, H_2O



2.
In the following reactions, find the products A and B?



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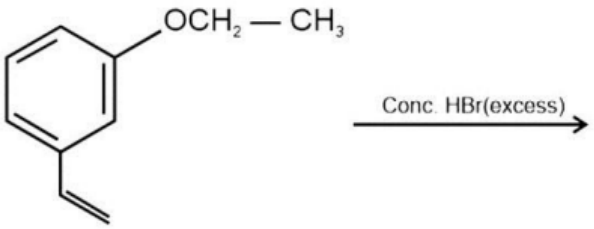
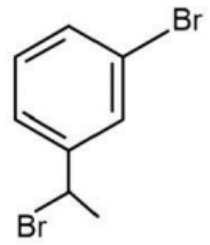
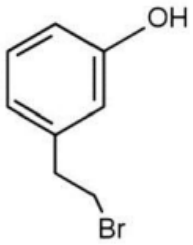
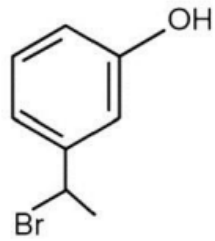
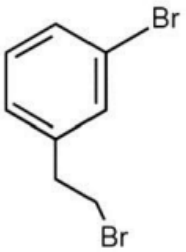
3. The major product formed in the following reaction is:



(1) 

(2) 

(3) 

(4) 

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4. Which of the following coordination compounds contains a bridging carbonyl ligand?

(1) $[Mn_2(CO)_{10}]$
(2) $[Co_2(CO)_8]$
(3) $[Cr(CO)_6]$
(4) $[Fe(CO)_5]$

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5. Energy difference between the actual structure of a compound and its most stable resonating structure (having least energy) is called:

(1) Heat of hydrogenation
(2) Resonance energy
(3) Heat of combustion
(4) Exchange energy

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6. What is the effect that occurs between a lone pair and a π-bond?

(1) Inductive
(2) Electromeric
(3) Resonance
(4) Hyperconjugation

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7. Which of the following statements is incorrect?

(1) $\Delta G = 0$ for a reversible process
(2) $\Delta G < 0$ for a spontaneous process
(3) $\Delta G > 0$ for a spontaneous process
(4) $\Delta G > 0$ for a non-spontaneous process

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8. Alkaline $KMnO_4$ oxidizes iodide to a particular product (A). Determine the oxidation state of

iodine in compound (A).

(1) +2
(2) +3
(3) +5
(4) +7

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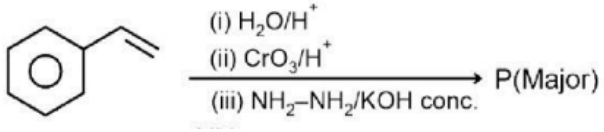
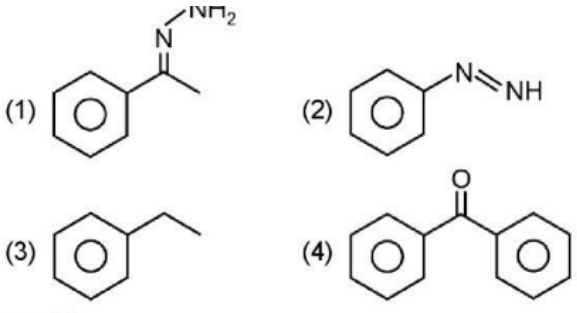
9. Find the product P of the following reaction:





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10. A container contains 1 g of H_2 gas and 1 g of O_2 gas. What is the ratio of their partial pressures $\left(\frac{P_{H_2}}{P_{O_2}}\right)$?

(1) 16 : 1
(2) 8 : 1
(3) 4 : 1
(4) 1 : 1

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11. Match the following:

Column I (Ores)	**Column II (Formula)**
(A) Fluorspar	(p) $Al_2O_3 \cdot 2H_2O$
(B) Cryolite	(q) CaF_2
(C) Bauxite	(r) $MgCO_3 \cdot CaCO_3$
(D) Dolomite	(s) $Na_3[AlF_6]$

(1) (A)-(s); (B)-(q); (C)-(r); (D)-(p)
(2) (A)-(q); (B)-(s); (C)-(p); (D)-(r)
(3) (A)-(p); (B)-(q); (C)-(s); (D)-(r)
(4) (A)-(q); (B)-(s); (C)-(r); (D)-(p)

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12. Which element(s) is/are confirmed by the appearance of a blood–red colour with $FeCl_3$ in Lassaigne's test?

(1) Presence of S only
(2) Presence of N and S
(3) Presence of N only
(4) Presence of P only

13. Statement 1: Electronegativity of Group 14 elements decreases from Si to Pb.
Statement 2: Group 14 has metals, metalloids, and non-metals.

(1) Both Statements 1 and 2 are correct
(2) Both Statements 1 and 2 are incorrect
(3) Statement 1 is correct and Statement 2 is incorrect
(4) Statement 1 is incorrect and Statement 2 is correct

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14. Hydrolysis of proteins gives which type of amino acid?

(1) α-Amino acid
(2) β-Amino acid
(3) γ-Amino acid
(4) δ-Amino acid

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15. Statement 1: Ionisation energy decreases in a period.
Statement 2: In a period, nuclear charge (Z) dominates over screening effect.

(1) Both statements 1 and 2 are correct
(2) Both statements 1 and 2 are incorrect
(3) Statement 1 is correct and Statement 2 is incorrect
(4) Statement 1 is incorrect and Statement 2 is correct

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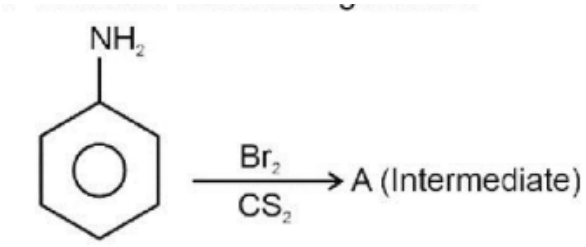
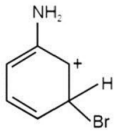
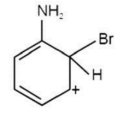
16. Consider the following reaction:



(1) 

(2) 

(3) Both (1) and (2)
(4) None of these

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17. Match the following:

Column I (Complexes)	Column II (Metals)
A. Vitamin B_{12}	(p) Ti
B. Wilkinson catalyst	(q) Co
C. Ziegler–Natta catalyst	(r) Fe
D. Haemoglobin	(s) Rh

(1) A(q), B(s), C(p), D(r)
(2) A(s), B(q), C(r), D(p)
(3) A(q), B(p), C(r), D(s)
(4) A(q), B(r), C(p), D(s)

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18. In the reaction:
$K2Cr2O7 + H2O2 + H2SO4 - > [cold\ conditions]X$
X is a chromium compound. What is the oxidation state of chromium in X?

(1) +6
(2) +3
(3) +5
(4) +10

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19. Balance the following reaction and determine the values of x, y, z, and p:

$xCl2 + yOH^- - > zCl^- + pClO^-$

(1) x = 1, y = 2, z = 2, p = 1
(2) x = y = z = p = 1
(3) x = 1, y = 1, z = 2, p = 1
(4) x = 1, y = 2, z = 1, p = 1

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20. For Rb (Z = 37), which set of quantum numbers is correct for the valence electron?

(1) 5, 0, 0, $+\frac{1}{2}$
(2) 5, 0, 1, $-\frac{1}{2}$
(3) 5, 0, 1, $+\frac{1}{2}$
(4) 5, 1, 1, $+\frac{1}{2}$

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21. Calculate the molarity of a solution having density = 1.5 g/mL. The solution contains 36% (w/w) solute and the molecular weight of solute is 36 g/mol.

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22. Given that $K_{net} = K_1K_2/K_3$ and the energies are:
$E_{a1} = 40$ kJ/mol, $E_{a2} = 50$ kJ/mol, $E_{a3} = 60$ kJ/mol.
Calculate the net activation energy $(E_a)_{net}$.

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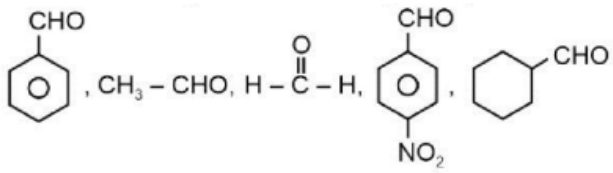
23. Positive Fehling solution test is given by



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24. How many of the following compounds have one lone pair on the central atom?
ClF_3, XeO_3, BrF_5, XeF_4, O_3, NH_3

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25. How many of the following species have bond order = 1 and are also paramagnetic?
He_2^{2+}, O_2^{2-}, Ne_2^{2+}, F_2, B_2, H_2, O_2^+

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26. How many of the following compounds contain a sulphur atom?
Pyrrole, Furan, Thiophene, Cysteine, Tyrosine, Pyridine

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27. Through a $ZnSO_4$ solution, a current of 0.015 A was passed for 15 minutes. What is the mass of Zn deposited? (in mg)
(Atomic weight of Zn = 65.4)

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28. Osmotic pressure at 273 K is 7×10^5 Pa. What will be its osmotic pressure at 283 K?
$\pi_{295} = x \times 10^4$ Pa

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29. For the reaction:
$2NOCl(g) <=> 2NO(g) + Cl2(g)$
$K_p = 36 \times 10^{-2}$ atm^{-1}. Find K_c at 300 K (nearest integer).
