JEE Main 2023 Jan 25 Shift 2 chemistry Question Paper

Time Allowed :1 Hour	Maximum Marks :100	Total Questions :30

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 90 questions. The maximum marks are 300.
3. There are three parts in the question paper consisting of Physics, Chemistry and Mathematics having 30 questions in each part of equal weightage.
4. Each part (subject) has two sections.
   (i) Section-A: This section contains 20 multiple choice questions which have only one correct answer. Each question carries 4 marks for correct answer and –1 mark for wrong answer.
   (ii) Section-B: This section contains 10 questions. In Section-B, attempt any five questions out of 10. The answer to each of the questions is a numerical value. Each question carries 4 marks for correct answer and –1 mark for wrong answer. For Section-B, the answer should be rounded off to the nearest integer.

1. Match List I with List II:

List I	List II
A. Cobalt catalyst	I. $H_2 + Cl_2$ production
B. Syngas	II. Water gas production
C. Nickel catalyst	III. Coal gasification
D. Brine solution	IV. Methanol production

Options:
(1) A-IV, B-I, C-II, D-III
(2) A-IV, B-III, C-I, D-II
(3) A-II, B-III, C-IV, D-I
(4) A-IV, B-III, C-II, D-I

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2. Given are two statements:
Statement I: In froth flotation method a rotating paddle agitates the mixture to drive air out of it.
Statement II: Iron pyrites are generally avoided for extraction of iron due to environmental reasons.
Options:
(1) Both Statement I and Statement II are true
(2) Statement I is false but Statement II is true

(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are false

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3. Which of the following represents the correct order of metallic character of the given elements?
Options:
(1) $Si < Be < Mg < K$
(2) $Be < Si < Mg < K$
(3) $K < Mg < Be < Si$
(4) $Be < Si < K < Mg$

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4. Given below are two statements, one labeled as Assertion A and the other as Reason R:
Assertion A: The alkali metals and their salts impart characteristic color to reducing flame.
Reason R: Alkali metals can be detected using flame tests.
Options:
(1) Both A and R are correct but R is NOT the correct explanation of A.
(2) A is correct but R is not correct.
(3) A is not correct but R is correct.
(4) Both A and R are correct and R is the correct explanation of A.

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5. What is the mass ratio of ethylene glycol ($C_2H_6O_2$, molar mass = 62 g/mol) required for making 500 g of 0.25 molar aqueous solution and 250 mL of 0.25 molar aqueous solution?
(1) 1 : 1
(2) 3 : 1
(3) 2 : 1
(4) 1 : 2

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6. Given two statements about dipole moments:
Statement I: Dipole moment is a vector quantity and by convention it is depicted by a small arrow with tail on the negative center and head pointing towards the positive center.
Statement II: The crossed arrow of the dipole moment symbolizes the direction of the shift of charges in the molecules.
Options:
(1) Both Statement I and Statement II are correct.
(2) Statement I is incorrect but Statement II is correct.
(3) Both Statement I and Statement II are incorrect.
(4) Statement I is correct but Statement II is incorrect.
Correct Answer: (4) Statement I is correct but Statement II is incorrect.

7. Given below are two statements, one labeled as Assertion A and the other as Reason R:
Assertion A: Butylated hydroxyl anisole when added to butter increases its shelf life.
Reason R: Butylated hydroxyl anisole is more reactive towards oxygen than food.
Options:
(1) Both A and R are correct and R is the correct explanation of A.
(2) A is correct but R is not correct.
(3) A is not correct but R is correct.
(4) Both A and R are correct but R is NOT the correct explanation of A.

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8. Given below are several statements:
A. Ammonium salts produce haze in the atmosphere.
B. Ozone gets produced when atmospheric oxygen reacts with chlorine radicals.
C. Polychlorinated biphenyls act as cleaning solvents.
D. 'Blue baby' syndrome occurs due to the presence of excess sulphate ions in water.
Options:
(1) A, B and C only
(2) B and C only
(3) A and D only
(4) A and C only

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9. Match List I with List II:

List I (Amines):	**List II (pKb):**
A. Aniline	**I.** 3.25
B. Ethylamine	**II.** 3.00
C. N-Ethylethanamine	**III.** 9.38
D. N,N-Diethylethanamine	**IV.** 3.29

Options:
(1) A-I, B-IV, C-II, D-III
(2) A-III, B-II, C-I, D-IV
(3) A-III, B-II, C-IV, D-I
(4) A-III, B-IV, C-II, D-I

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10. Which one among the following metals is the weakest reducing agent?
Options:
(1) K
(2) Rb
(3) Na
(4) Li

11. Match List I with List II:

List I (Isomeric pairs)	List II (Type of isomers)
A. Propanamine and N-Methylethanamine	I. Metamers
B. Hexan-2-one and Hexan-3-one	II. Positional isomers
C. Ethanamide and Hydroxyethanamine	III. Functional isomers
D. o-nitrophenol and p-nitrophenol	IV. Tautomers

Options:
(1) A-III, B-IV, C-I, D-II
(2) A-IV, B-III, C-I, D-II
(3) A-II, B-III, C-I, D-IV
(4) A-III, B-I, C-IV, D-II

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12. Match List I with List II (Uses of polymers):

List I (Name of polymer)	List II
A. Glyptal	I. Flexible pipes
B. Neoprene	II. Synthetic wool
C. Acrilan	III. Paints and Lacquers
D. LDP	IV. Gaskets

Options:
(1) A-III, B-II, C-IV, D-I
(2) A-III, B-IV, C-II, D-I
(3) A-III, B-IV, C-I, D-II
(4) A-III, B-I, C-IV, D-II

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13. Given below are two statements, one labeled as Assertion A and the other as Reason R:
Assertion A: Carbon forms two important oxides — CO and CO2. CO is neutral whereas CO2 is acidic in nature.
Reason R: CO2 can combine with water in a limited way to form carbonic acid, which is sparingly soluble in water.
Options:
(1) Both A and R are correct and R is the correct explanation of A.
(2) Both A and R are correct but R is NOT the correct explanation of A.
(3) A is not correct but R is correct.
(4) A is correct but R is not correct.
Correct Answer: (2) Both A and R are correct but R is NOT the correct explanation of A.

14. Potassium dichromate acts as a strong oxidizing agent in acidic solution. During this process, the oxidation state changes from:
Options:
(1) +3 to +1
(2) +6 to +3
(3) +2 to +1
(4) +6 to +2

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15. When the hydrogen ion concentration [H^+] changes by a factor of 1000, the value of pH of the solution:
Options:
(1) increases by 1000 units
(2) decreases by 3 units
(3) decreases by 2 units
(4) increases by 2 units

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16. Match List I with List II:

List I (Coordination entity):	**List II (Wavelength of light absorbed in nm):**
A. $[CoCl(NH_3)_5]^{2+}$	I. 310
B. $[Co(NH_3)_6]^{3+}$	II. 475
C. $[Co(CN)_6]^{3-}$	III. 535
D. $[Cu(H_2O)_4]^{2+}$	IV. 600

Options:
(1) A-IV, B-I, C-III, D-II
(2) A-III, B-II, C-I, D-IV
(3) A-III, B-I, C-II, D-IV
(4) A-II, B-III, C-IV, D-I

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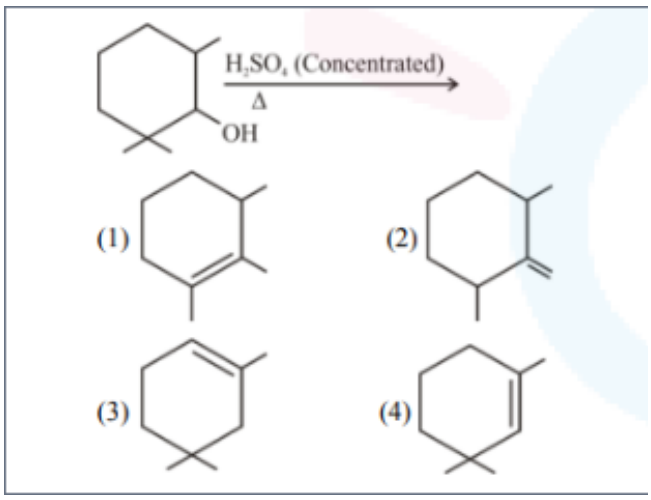
17. Find out the major product from the following reaction with concentrated H_2SO_4:



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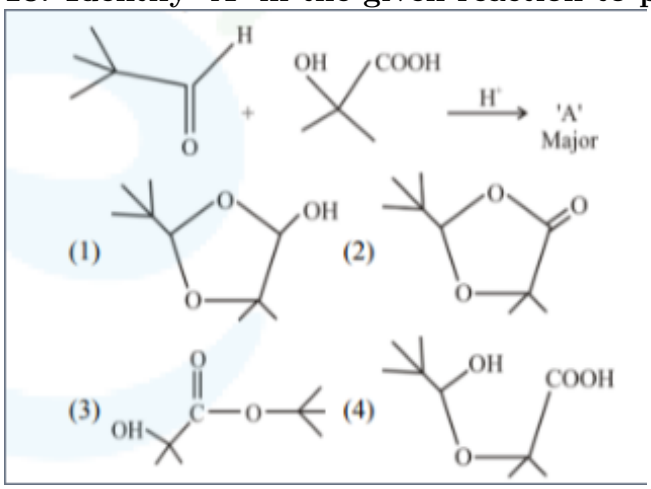
18. Identify 'A' in the given reaction to produce the major product:



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19. The isomeric deuterated bromide with molecular formula C_4H_9Br having two chiral carbon atoms is:

Options:

(1) 2-Bromo-1-deuterobutane

(2) 2-Bromo-2-deuterobutane

(3) 2-Bromo-3-deuterobutane

(4) 2-Bromo-1-deutero-2-methylpropane

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20. A chloride salt solution acidified with dil. HNO_3 gives a curdy white precipitate, [A], on addition of $AgNO_3$. [A] on treatment with NH_4OH gives a clear solution, B. The correct products are:

Options:

(1) $[HAgCl]_2$ and $[Ag(NH_3)_2]Cl$

(2) $[HAgCl]_3$ and $[NH_4](AgOH)_2$

(3) AgCl and $[Ag(NH_3)_2]Cl$

(4) AgCl and $[NH_4](AgOH)_2$

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21. The number of given orbitals which have electron density along the axis is:

P_x, P_y, P_z, d_{xy}, d_{yz},d_{xy}, d_z^2, $d_{x^2-y^2}$

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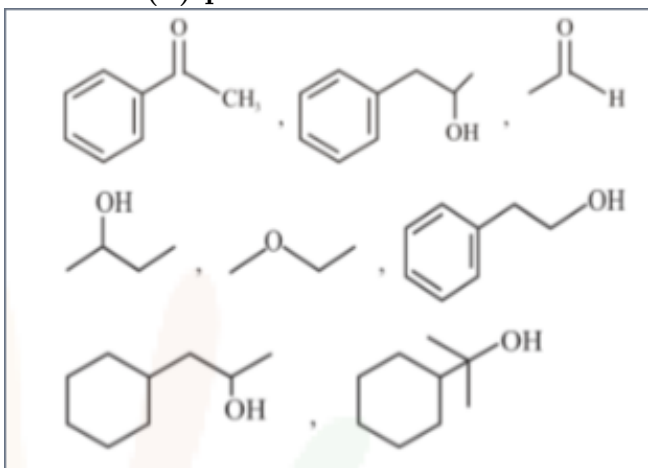
22. Number of compounds giving (i) red colouration with ceric ammonium nitrate and also (ii) positive iodoform test from the following is:



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23. The number of pairs of the solution having the same value of osmotic pressure from the following is:
Options:
A. 0.500 M C_6H_5OH (aq) and 0.25 M KBr (aq)
B. 0.100 M $K_4[Fe(CN)_6]$ (aq) and 0.100 M $FeSO_4(NH_4)_2SO_4$ (aq)
C. 0.05 M $K_4[Fe(CN)_6]$ (aq) and 0.25 M NaCl (aq)
D. 0.15 M NaCl (aq) and 0.1 M $BaCl_2$ (aq)
E. 0.02 M KCl $MgCl_2.6H_2O$ (aq) and 0.05 M KCl (aq)

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24. 28.0 L of CO_2 is produced on complete combustion of 16.8 L gaseous mixture of ethene and methane at 25°C and 1 atm. Heat evolved during the combustion process is ___ kJ.
Given:
$\Delta H_c(CH_4) = -900$ kJ/mol
$\Delta H_c(C_2H_4) = -1400$ kJ/mol

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25. Total number of moles of AgCl precipitated on addition of excess of AgNO3 to one mole each of the following complexes: $[Co(NH_3)_2Cl_2]Cl$, $[Ni(H_2O)_6]Cl_2$, $[Pt(NH_3)_2Cl_2]$,

and $[Pd(NH_3)_4]Cl_2$

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26. Number of hydrogen atoms per molecule of a hydrocarbon A having 85.8% carbon is:
Given: Molar mass of A = 84 g/mol
Correct Answer: (12.00)

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27. $\mathbf{Pt(s)|H_2(g)(1bar)|H^+(aq)(1M)||}M^{3+}(aq), M^+(aq)|\mathbf{Pt(s)}$
The E_{cell} for the given cell is 0.1115 V at 298 K when $\frac{[M^+(aq)]}{[M^{3+}(aq)]} = 10^a$.
Given:
$E^0_{M^{3+}/M^+} = 0.2$ V
$2.303\frac{RT}{F} = 0.059$ V

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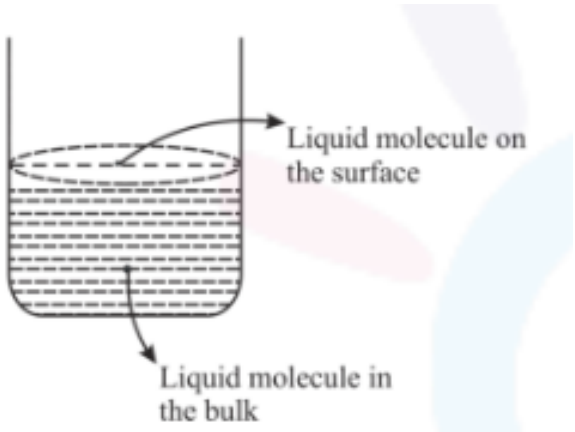
28. Based on the given figure, the number of correct statement/s is/are
Options:
A. Surface tension is the outcome of equal attractive and repulsion forces acting on the liquid molecule in bulk.
B. Surface tension is due to uneven forces acting on the molecules present on the surface.
C. The molecule in the bulk can never come to the liquid surface.
D. The molecules on the surface are responsible for vapor pressure if the system is a closed system.



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29. A first order reaction has the rate constant, k = 4.6 $\times 10^{-3} s^{-1}$. The number of correct statement/s from the following is/are
Options:
A. Reaction completes in 1000 s.
B. The reaction has a half-life of 500 s.
C. The time required for 10% completion is 25 times the time required for 90% completion.

D. The degree of dissociation is equal to $1 - e^{-kt}$.
E. The rate and the rate constant have the same unit.

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30. The number of incorrect statement/s from the following is/are
Options:
A. Water vapours are adsorbed by anhydrous calcium chloride.
B. There is a decrease in surface energy during adsorption.
C. As the adsorption proceeds, ΔH becomes more and more negative.
D. Adsorption is accompanied by a decrease in entropy of the system.