

Use the following codes to answer Q1-Q5:

- (1) If both assertion (A) as well as reason (R) are correct and (R) is the correct explanation of (A)
- (2) If both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (3) If (A) is correct but (R) is incorrect
- (4) If (A) is incorrect but (R) is correct

Q1. Assertion (A): Most of the compounds of the transition elements are colored in solid and solution state .

Reason (R) : during d-d transition the d –electrons absorb certain radiation from the visible region of the spectrum.

Q2. Assertion (A) : a lighter gas diffuses more rapidly than a heavier gas .

Reason (R) : at a given temperature , the rate of diffusion of a gas is inversely proportional to the square root of its density

Q3. Assertion (A): in rate laws, the exponents for concentration do not necessarily match the stoichiometric coefficients .

Reason (R) : it is the mechanism and not the balanced chemical equation for the overall change that governs the reaction rate.

Q4. Assertion (A) : a mixture of the solutions of a weak acid and its sodium salt acts as a good buffer.

Reason (R) : the ratio of the salt to the acid in the mixture does not change substantially when small amount of acid or base is added to the buffer.

Q5. Assertion (A) : Surface tension is zero at critical temperature .

Reason (R): at critical temperature surface disappears.

Q6. Equilibrium constant K changes with temperature .At 300 K, equilibrium constant is 25 and at 400 K it is 10. Hence ,backward reaction will have energy of activation:

- (1) Equal to that of forward reaction
- (2) Less than that of forward reaction
- (3) Greater than that of forward reaction
- (4) Given values are not sufficient to explain given statements.

Q7. Pure oxygen diffuses through an aperture in **112** seconds, whereas an equal volume of a mixture of oxygen and another gas containing **80%** oxygen diffuses from the same aperture in **224** seconds. Then the molecular weight of the gas is ?

- (1)** 1024 **(2)** 512 **(3)** 256 **(4)** 128

Q8-Q9 are based on this short paragraph:

Like all chemical and physical processes, the dissolution of a substance in a solvent has associated with it a free-energy change ΔG .

Q8. When KCl dissolves, in water :

- (1) $\Delta H > 0, \Delta S > 0$ and $\Delta G > 0$
- (2) $\Delta H > 0, \Delta S < 0$ and $\Delta G < 0$
- (3) $\Delta H > 0, \Delta S > 0$ and $\Delta G < 0$
- (4) $\Delta H < 0, \Delta S < 0$ and $\Delta G > 0$

Q9. During dissolution of a solute in a solvent, following the three operative interactions

I : Solvent- solvent

II : Solute- solvent

III: Solute –solute

Which of the following takes places with the absorption of heat ?

- (1) I and II
- (2) II and III
- (3) I, II and III
- (4) I and III

Q10. The dissolving process is exothermic when :

- (1) The energy released in salvation exceed the energy used in breaking up solute-solute and solvent –solvent interactions.
- (2) The energy used in salvation exceeds the energy released in breaking up solute-solute and solvent –solvent interactions .
- (3) The energy released in salvation is about the same as the energy used in breaking up solute –solute and solvent –solvent interactions.
- (4) The energy used in salvation is about the same as the energy used in breaking up solute-solute and solvent –solvent interactions.

Q11. The vapor pressure of a pure liquid A is 40 mm of Hg at 310 K. The vapor pressure of this liquid in a solution with liquid B is 32mm of Hg. Mole fraction of A in the solution, if it obeys Raoult's law is :

- (1) .8
- (2) 0.5
- (3) 0.2
- (4) 0.4

Q12. CuSO_4 can be estimated volumetrically :

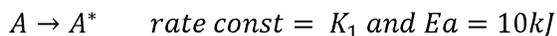
- (1) By reaction with KI followed by reaction with $\text{Na}_2\text{S}_2\text{O}_3$
- (2) By reaction with BaCl_2
- (3) By reaction with $\text{K}_4\text{Fe}(\text{CN})_6$
- (4) None is correct

Q13. Which of the following will not give metal on heating ?

- (a) Ag_2CO_3 (b) ZnCO_3 (c) HgO (d) CuO

- (1) (a) and (b)
- (2) (b) and (c)
- (3) (b) and (d)
- (4) (a) and (d)

Q14. For a chemical reaction $A \rightarrow \text{Product}$ with rate constant K , following mechanism has been proposed :



The overall rate constant K is related to the individual rate constant as $K = \sqrt{K_1 K_2}$, then :

- (1) Activation energy for the overall reaction is 20 kJ
- (2) Activation energy for the overall reaction is 15 kJ
- (3) Arrhenius Parameter for the overall rate constant is the arithmetic mean of the Arrhenius parameter of the individual rate constant.
- (4) None of these.

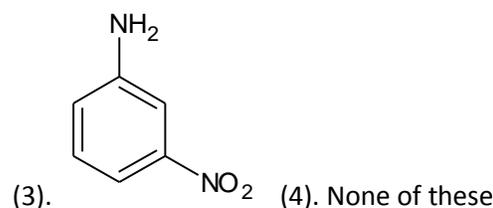
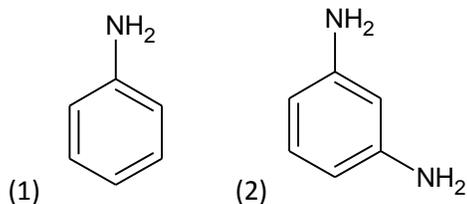
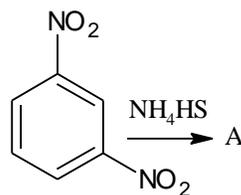
Q15. One mole of He (g) is mixed isothermally and reversibly with 2.0 mole of Ne(g). if ΔS for this mixture is of the form $\Delta S = aR \ln \left(\frac{b}{c} \right)$, where R is the ideal gas constant and a, b and c are positive non zero real numbers. Then

- (1) $a = 1$, $b = 27$ and $c = 4$
- (2) $a = 2$, $b = 9$ and $c = 2$
- (3) $a = 9$, $b = 9$ and $c = 2$
- (4) can't find

Q16. An aqueous solution of ethanol has density 1.025 g/mL and it is 8.0 M. Then the molality of this solution close to nearest integer is ?

- (1) 10 (2) 11 (3) 12 (4) 13

Q17. The product of the following reaction is



Q18. AlCl_3 exists as dimer Al_2Cl_6 in solid state as well as in solution of non-polar solvents such as benzene. when dissolved in water, it gives :

- (1) $\text{Al}^{3+} + 3\text{Cl}^-$
- (2) $[\text{Al}(\text{H}_2\text{O})_6]^{3+} + 3\text{Cl}^-$
- (3) $[\text{Al}(\text{OH})_6]^{3-} + 3\text{HCl}$
- (4) $\text{Al}_2\text{O}_3 + 6\text{HCl}$

Q19. Glucose on treatment with hydrogen chloride in methanol affords :

- (1) Pentamethyl glucose
- (2) α - methyl glucoside
- (3) β - methyl glucoside
- (4) A mixture of α and β methyl glucosides

Q20. The diseases identified as diabetes are primarily associated with a malfunction of the hormone :

- (1) Glucagon
- (2) Insulin
- (3) Epinephrine
- (4) Cortisone

Q21. The appearance of color in solid alkali metal halides is generally due to :

- (1) F- centers
- (2) Schottky defect
- (3) Frenkel defect
- (4) Interstitial effect

Q22. Saponification of an ester (A) followed by neutralization gives a compound (B) , which gives violet coloration with FeCl_3 . The ester (A) is ?

- (1) Ethyl salicylate
- (2) Ethyl acetate
- (3) Ethyl benzoate
- (4) Diethyl phthalate

Q23. Benzene diazonium salt can be made nitrogen free using :

- (1) H_3PO_2
- (2) HNO_2
- (3) H_3PO_3
- (4) H_3PO_4

Q24. Select correct statement(s) :

- (1) A compound with delocalised electrons is more stable than the compound would be if all its electrons were localised
- (2) Six pi- electrons delocalised in benzene are referred to as the aromatic sextet.
- (3) When a compound attains aromaticity ,potential energy is decreased.
- (4) All the above are correct statements.

Q25. Which is the best reagent to convert RCOOH to RCOCl ?

- (1) PCl_3
- (2) PCl_5
- (3) SOCl_2
- (4) HCl

Q26. Which statement is not true about cannizzaro Reaction ?

- (1) It is a disproportionation reaction
- (2) It is a proton hydride transfer reaction
- (3) It is given by all the carbonyl compounds
- (4) It takes place with 50% aqueous or ethanolic solution.

Q27. The end product of hydrolysis of XeF_6 is?

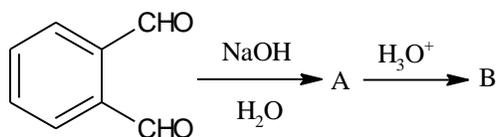
- (1) XeF_4O
- (2) XeF_2O_2
- (3) XeO_3
- (4) XeO_3^-

Q28. Gold number of a lyophilic sol is such property that :

- (1) Larger its value , the greater is the peptizing power
- (2) The lower its value, the greater is the peptizing power
- (3) The lower its value, the greater is the protecting power
- (4) The larger its value, the greater is the protecting power

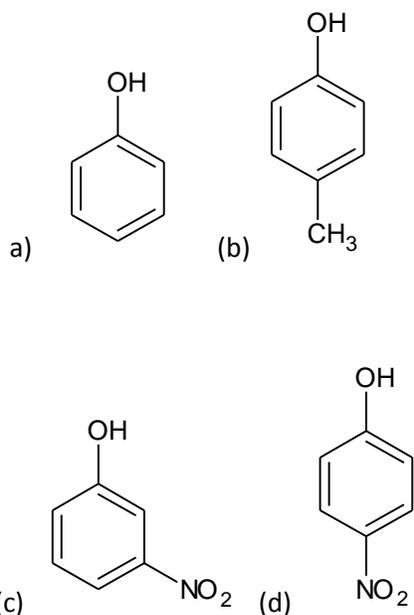
- (1) $b < a < c < d$
- (2) $c > d > b > a$
- (3) $d < c < a < b$
- (4) $d < c < b < a$

Q29. The final major product of the following reaction



- (1) Is both an acid as well an aldehyde
- (2) Is a cyclic ester
- (3) Is both an acid and an alcohol
- (4) Is an alcohol and aldehyde.

Q30. In the following reaction , the order of acidity is :



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