

JEE MAINS 2018 15TH APRIL 2018 MORNING SHIFT  
CHEMISTRY

31. The volume of 0.1N dibasic acid sufficient to neutralize 1 g of a base that furnishes 0.04 mole of  $\text{OH}^-$  in aqueous solution is :

- (1) 200 mL
- (2) 400 mL
- (3) 600 mL
- (4) 800 mL

32. Initially, the *root mean square (rms)* velocity of  $\text{N}_2$  molecules at certain temperature is  $u$ . If this temperature is doubled and all the nitrogen molecules dissociate into nitrogen atoms, then the new *rms* velocity will be :

- (1)  $u/2$
- (2)  $2u$
- (3)  $4u$
- (4)  $14u$

33. Aqueous solution of which salt will not contain ions with the electronic configuration  $1s^2 2s^2 2p^6 3s^2 3p^6$  ?

- (1) NaF

- (2) NaCl
- (3) KBr
- (4) CaI<sub>2</sub>

34. The bond angle H-X-H is the greatest in the compound :

- (1) CH<sub>4</sub>
- (2) NH<sub>3</sub>
- (3) H<sub>2</sub>O
- (4) PH<sub>3</sub>

35. If 100 mole of H<sub>2</sub>O<sub>2</sub> decompose at 1 bar and 300 K, the work done (kJ) by one mole of O<sub>2</sub>(g) as it expands against 1 bar pressure is :



$$(R = 8.3 \text{ JK}^{-1} \text{ mol}^{-1})$$

- (1) 62.25
- (2) 124.50
- (3) 249.00
- (4) 498.00

36. An aqueous solution of a salt  $\text{MX}_2$  at certain temperature has a van't Hoff factor of 2. The degree of dissociation for this solution of the salt is :

- (1) 0.33
- (2) 0.50
- (3) 0.67
- (4) 0.80

37. A solid  $\text{XY}$  kept in an evacuated sealed container undergoes decomposition to form a mixture of gases  $X$  and  $Y$  at temperature  $T$ . The equilibrium pressure is 10 bar in this vessel.

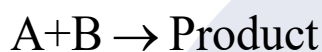
$K_p$  for this reaction is :

- (1) 5
- (2) 10
- (3) 25
- (4) 100

38. Oxidation of succinate ion produces ethylene and carbon dioxide gases. On passing 0.2 Faraday electricity through an aqueous solution of potassium succinate, the total volume of gases (at both cathode and anode) at STP (1 atm and 273 K) is :

- (1) 2.24 L
- (2) 4.48 L
- (3) 6.72 L
- (4) 8.96 L

39. The rate law for the reaction below is given by the expression  $k[A][B]$



If the concentration of B is increased from 0.1 to 0.3 mole, keeping the value of A at 0.1 mole, the rate constant will be :

- (1)  $k$
- (2)  $k/3$
- (3)  $3k$
- (4)  $9k$

40. Gold numbers of some colloids are : Gelatin : 0.005 - 0.01, Gum Arabic : 0.15 - 0.25; Oleate : 0.04 - 1.0; Starch : 15 - 25. Which among these is a better protective colloid ?

- (1) Gelatin
- (2) Gum Arabic
- (3) Oleate

(4) Strach

41. The following statements concern elements in the periodic table.

Which of the following is true?

(1) All the elements in Group 17 are gases.

(2) The Group 13 elements are all metals.

(3) Elements of Group 16 have lower ionization enthalpy values compared to those of Group 15 in the corresponding periods.

(4) For Group 15 elements, the stability of +5 oxidation state increases down the group.

42. Extraction of copper by smelting uses silica as an additive to remove :

(1)  $\text{Cu}_2\text{S}$

(2)  $\text{FeO}$

(3)  $\text{FeS}$

(4)  $\text{Cu}_2\text{O}$

43. Identify the reaction which does not liberate hydrogen:

(1) Reaction of zinc with aqueous alkali

- (2) Electrolysis of acidified water using Pt electrodes.
- (3) Allowing a solution of sodium in liquid ammonia to stand.
- (4) Reaction of lithium hydride with  $B_2H_6$ .

44. The commercial name for calcium oxide is : (1) (2) (3)

Limestone (4)

- (1) Milk of lime
- (2) Slaked lime
- (3) Limestone
- (4) Quick lime

45. **Assertion:** Among the carbon allotropes, diamond is an insulator, whereas, graphite is a good conductor of electricity.

**Reason:** Hybridization of carbon in diamond and graphite are  $sp^3$  and  $sp^2$ , respectively.

- (1) Both assertion and reason are correct, and the reason is the correct explanation for the assertion.
- (2) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion.
- (3) Assertion is incorrect statement, but the reason is correct.
- (4) Both assertion and reason are incorrect.

46. Identify the incorrect statement:

- (1)  $S_2$  is paramagnetic like oxygen.
- (2) Rhombic and monoclinic sulphur have  $S_8$  molecules.
- (3)  $S_8$  ring has a crown shape.
- (4) The S-S-S bond angles in the  $S_8$  and  $S_6$  rings are the same.

47. Identify the correct statement:

- (1) Iron corrodes in oxygen-free water.
- (2) Iron corrodes more rapidly in salt water because its electrochemical potential is higher.
- (3) Corrosion of iron can be minimized by forming a contact with another metal with a higher reduction potential.
- (4) Corrosion of iron can be minimized by forming an impermeable barrier at its surface

48. Which of the following is an example of homoleptic complex ?

- (1)  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$
- (2)  $[\text{Pt}(\text{NH}_3)_2]\text{Cl}_2$
- (3)  $[\text{Co}(\text{NH}_3)_4]\text{Cl}_2$
- (4)  $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_3$

49. The transition metal ions responsible for color in ruby and emerald are, respectively :

(1)  $\text{Cr}^{3+}$  and  $\text{Co}^{3+}$

(2)  $\text{Co}^{3+}$  and  $\text{Cr}^{3+}$

(3)  $\text{Co}^{3+}$  and  $\text{Co}^{3+}$

(4)  $\text{Cr}^{3+}$  and  $\text{Cr}^{3+}$

50. Which one of the following substances used in dry cleaning is a better strategy to control environmental pollution?

(1) Tetrachloroethylene

(2) Carbon dioxide

(3) Sulphur dioxide

(4) Nitrogen dioxide

51. Sodium extract is heated with concentrated  $\text{HNO}_3$  before testing for halogens because :

(1) Silver halides are totally insoluble in nitric acid.

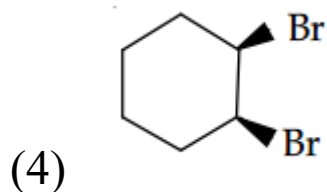
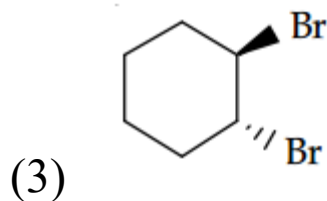
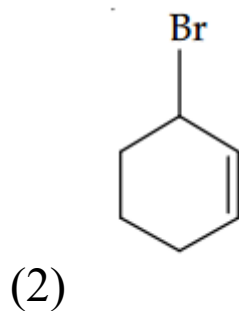
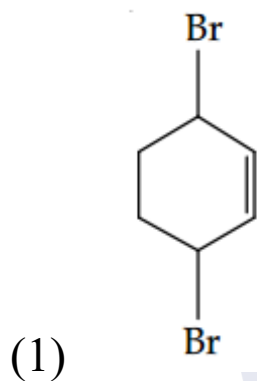
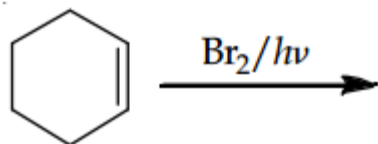
(2)  $\text{Ag}_2\text{S}$  and  $\text{AgCN}$  are soluble in acidic medium.

(3)  $\text{S}^{2-}$  and  $\text{CN}^-$ , if present, are decomposed by conc.  $\text{HNO}_3$  and hence do not interfere in the test.



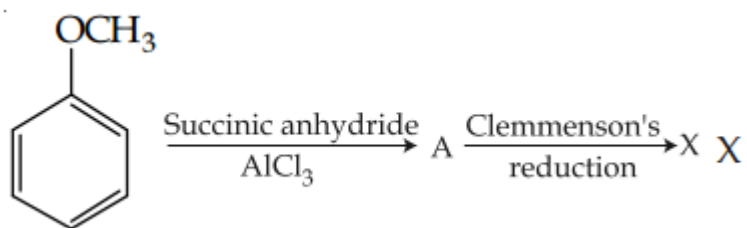
(4) Ag reacts faster with halides in acidic medium.

52. Bromination of cyclohexene under conditions given below yields :

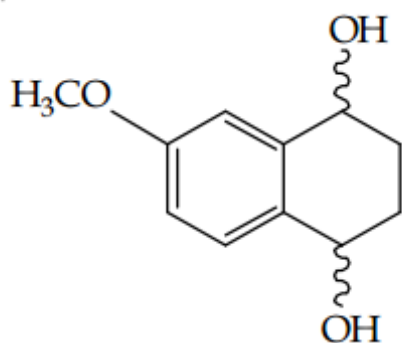


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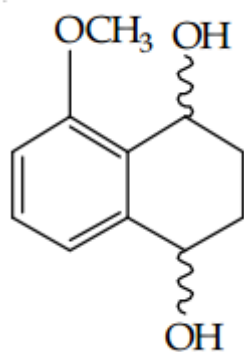
53. Consider the reaction sequence below :



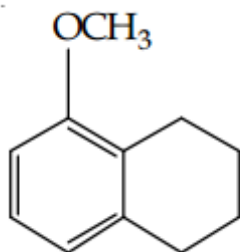
is:



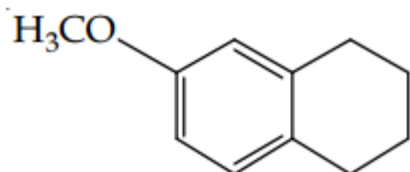
(1)



(2)

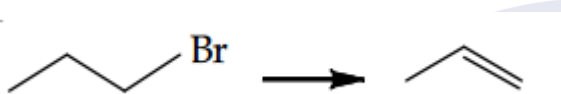


(3)



(4)

54. Which one of the following reagents is not suitable for the elimination reaction?



(1) NaOH/H<sub>2</sub>O

(2) NaOEt/EtOH

(3) NaOH/H<sub>2</sub>O-EtOH

(4) NaI

55. The correct statement about the synthesis of erythritol (C(CH<sub>2</sub>OH)<sub>4</sub>) used in the preparation of PETN is:

(1) The synthesis requires four aldol condensations between methanol and ethanol.

(2) The synthesis requires two aldol condensations and two Cannizzaro reactions.

(3) The synthesis requires three aldol condensations and one Cannizzaro reaction.

(4) Alpha hydrogens of ethanol and methanol are involved in this reaction.

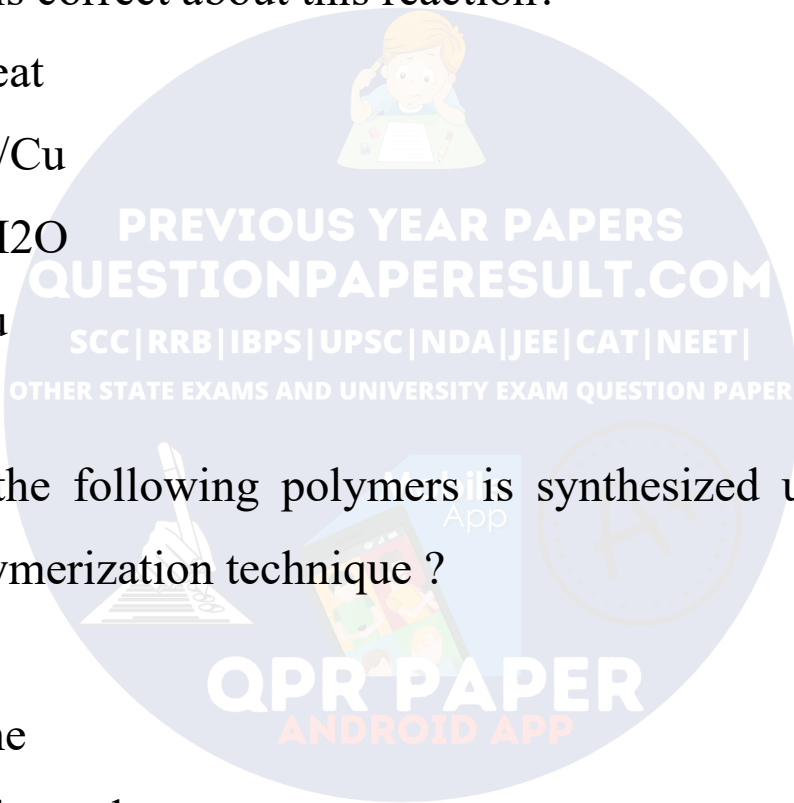
56. Fluorination of an aromatic ring is easily accomplished by treating a diazonium salt with  $\text{HBF}_4$ . Which of the following conditions is correct about this reaction?

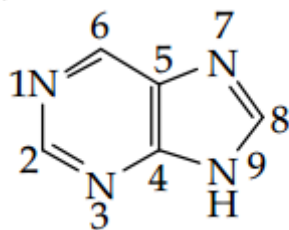
- (1) Only heat
- (2)  $\text{NaNO}_2/\text{Cu}$
- (3)  $\text{Cu}_2\text{O}/\text{H}_2\text{O}$
- (4)  $\text{NaF}/\text{Cu}$

57. Which of the following polymers is synthesized using a free radical polymerization technique ?

- (1) Teflon
- (2) Terylene
- (3) Melamine polymer
- (4) Nylon 6,6

58. The "N" which does not contribute to the basicity for the compound is :





- (1) N 7
- (2) N 9
- (3) N 1
- (4) N 3

59. Which of the following is a bactericidal antibiotic ?

- (1) Erythromycin
- (2) Tetracycline
- (3) Chloramphenicol
- (4) Ofloxacin

60. Observation of “Rhumann’s purple” is a confirmatory test for the presence of:

- (1) Reducing sugar
- (2) Cupric ion
- (3) Protein
- (4) Starch



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## PART-2

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31. The law of equivalence states that the equivalence of acid is equal to the equivalence of base.

$$s = ut + \frac{1}{2}at^2$$

Therefore, the volume required is calculated as,

$$s = (0)t + \frac{1}{2}at^2$$

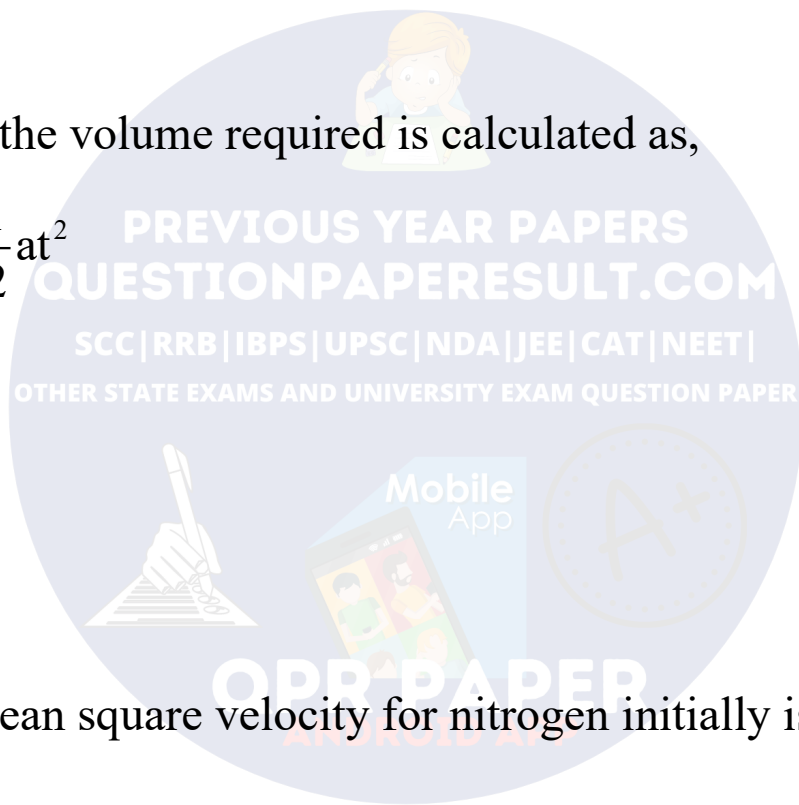
$$s = \frac{1}{2}at^2$$

$$t = \sqrt{\frac{2s}{a}}$$

32. The root mean square velocity for nitrogen initially is calculated as,

$$(d + 200)$$

The dissociation of all the nitrogen molecules into nitrogen atoms results in the new root mean square velocity, that is,



$$t = \sqrt{\frac{2d}{2}}$$

33. The ions  $(d + 200)$  and  $t = \sqrt{\frac{2(d + 200)}{4}}$  are the ones that are

$$\sqrt{\frac{2d}{2}} = \sqrt{\frac{2(d + 200)}{4}}$$

present in  $d = \frac{(d + 200)}{2}$  compound.

$$d = 200 \text{ m}$$

The ion  $t = \sqrt{\frac{2(200 \text{ m})}{2}}$  has an electronic configuration of  $10\sqrt{2} \text{ s}$ .

The ion  $M'$  has an electronic configuration of  $v'$ .

Therefore, configuration of sodium and fluoride ion does not match with the configuration given in the question.



$$2M'v'\sin\theta = Mv\cos45^\circ + Mv\cos30^\circ$$

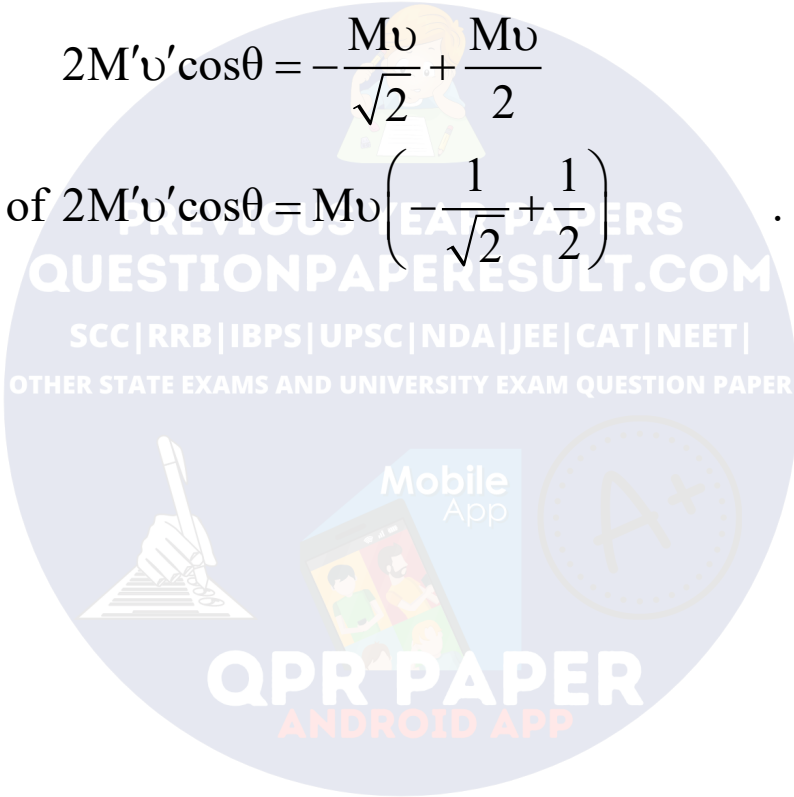
$$2M'v'\sin\theta = \frac{Mv}{\sqrt{2}} + \frac{\sqrt{3}Mv}{2}$$

34. In case of  $2M'v'\sin\theta = Mv\left(\frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2}\right)$ , the bond angle

$$2M'v'\cos\theta = -Mv\sin45^\circ + Mv\sin30^\circ$$

$$2M'v'\cos\theta = -\frac{Mv}{\sqrt{2}} + \frac{Mv}{2}$$

has a value of  $2M'v'\cos\theta = Mv\left(-\frac{1}{\sqrt{2}} + \frac{1}{2}\right)$ . While for



$$\frac{2M'v'\sin\theta}{2M'v'\cos\theta} = \frac{Mv\left(\frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2}\right)}{Mv\left(-\frac{1}{\sqrt{2}} + \frac{1}{2}\right)}$$

$$\tan\theta = \frac{\left(\frac{\sqrt{2} + \sqrt{3}}{2}\right)}{\left(\frac{1 - \sqrt{2}}{2}\right)}, \theta, \text{ and } \tan\theta = \frac{\sqrt{3} + \sqrt{2}}{1 - \sqrt{2}}, \text{ the bond}$$

$$\tan\theta = \frac{\sqrt{3} + \sqrt{2}}{1 - \sqrt{2}}$$

angles are  $\Delta PQR$ ,  $h = \sqrt{1^2 - \left(\frac{x}{2}\right)^2}$ , and  $v = \frac{dh}{dt}$  respectively.

$$= \frac{1}{2} \sqrt{4 - x^2}$$

35. The decomposition of  $\frac{dh}{dt}$  is given by,

$$\begin{aligned} \frac{dh}{dt} &= \frac{d}{dt} \left( \frac{1}{2} \sqrt{4-x^2} \right) \\ &= \frac{1}{2} \frac{d}{dx} \left( \frac{1}{2} \sqrt{4-x^2} \right) \frac{dx}{dt} \\ &= \frac{1}{4} \left( \frac{1}{\sqrt{4-x^2}} \right) (-2x) \frac{dx}{dt} \\ &= -\frac{x}{2\sqrt{4-x^2}} \frac{dx}{dt} \end{aligned}$$

From the given data,  $\frac{dh}{dt} = -\frac{1}{2\sqrt{\frac{4}{x^2}-1}} \frac{dx}{dt}$  of  $\sqrt{\frac{4}{x^2}-1}$  on

decomposition gives  $\sqrt{\frac{4}{x^2}-1}$  of  $\frac{dh}{dt}$ .

Thus, the work done by one mole of oxygen is calculated as,

$$T \cos \theta = mg$$

Therefore, the work done by oxygen gas is  $T \sin \theta = \frac{mv^2}{r}$ .

36. The decomposition of  $\tan \theta = \frac{v^2}{rg}$  is given by,

$$\tan 45^\circ = \frac{v^2}{(0.4 \text{ m})(10 \text{ ms}^{-2})}$$

$$v^2 = 4 \text{ m}^2 \text{ s}^{-2}$$

$$v = \sqrt{4 \text{ m}^2 \text{ s}^{-2}}$$

$$v = 2 \text{ ms}^{-1}$$

Therefore, the total number of particles after dissociation is calculated as,

$$2 \text{ ms}^{-1}$$

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The number of particles before dissociation is  $I_{\text{disc}} = \frac{MR^2}{2}$ .

The expression to calculate the Van't Hoff factor is given by,

$$\begin{aligned} I_{\text{removed}} &= \frac{1}{2} \left( \frac{M}{16} \right) \left( \frac{R^2}{16} \right) + \left( \frac{M}{16} \right) \left( \frac{9R^2}{16} \right) \\ &= \frac{MR^2 + 18MR^2}{512} \\ &= \frac{19MR^2}{512} \end{aligned}$$

Therefore, for the given solution the degree of dissociation is calculated as,

NaI

37. The solid NaI undergoes a decomposition as follows:



Therefore, the total pressure is calculated as,

$$\tan 45^\circ = \frac{v^2}{(0.4 \text{ m})(10 \text{ ms}^{-2})}$$

$$v^2 = 4 \text{ m}^2 \text{ s}^{-2}$$

$$v = \sqrt{4 \text{ m}^2 \text{ s}^{-2}}$$

$$v = 2 \text{ ms}^{-1}$$

Thus, the pressure  $2 \text{ ms}^{-1}$  is calculated as,

$$I_{\text{disc}} = \frac{MR^2}{2}$$

$$I_{\text{removed}} = \frac{1}{2} \left( \frac{M}{16} \right) \left( \frac{R^2}{16} \right) + \left( \frac{M}{16} \right) \left( \frac{9R^2}{16} \right)$$

Therefore, the value of  $I_{\text{removed}} = \frac{MR^2 + 18MR^2}{512}$  for

$$= \frac{19MR^2}{512}$$

the given reaction is calculated as,

$$I_{\text{remaining}} = \frac{MR^2}{2} - \frac{19MR^2}{512}$$
$$= \frac{237MR^2}{512}$$

38. Ethylene and carbon dioxide gases is evolved during the oxidation of succinate ion.

The ideal gas equation is given by,

$$\frac{237MR^2}{512}$$

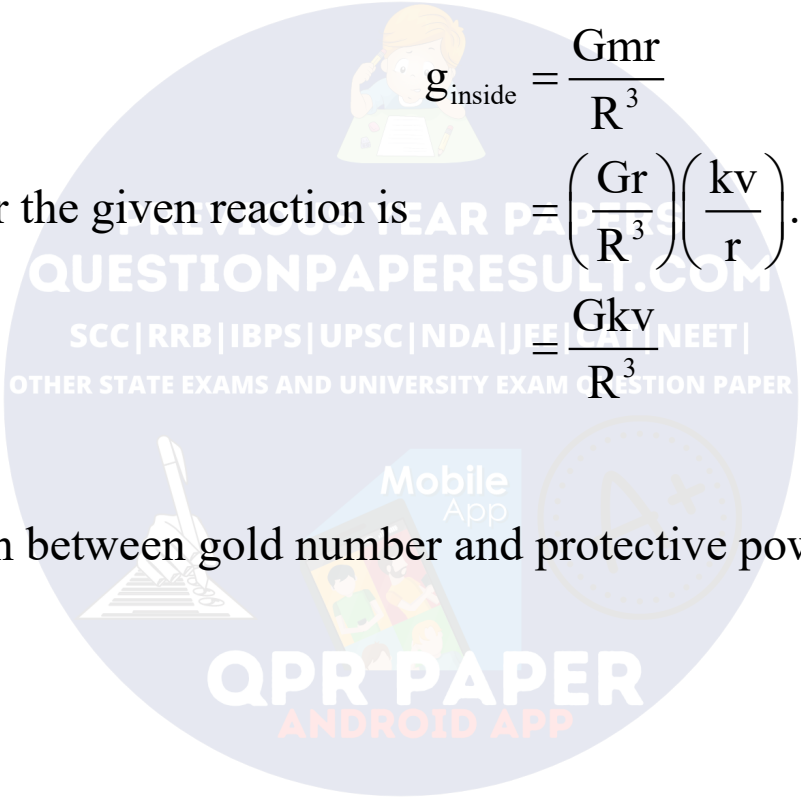
Rewrite the above formula.

$$\rho = \frac{m}{v} = \frac{k}{r}$$

Substitute all the values in the above formula.

$$m = \frac{kv}{r}$$

39. With the change in the concentration, the rate of reaction changes, whereas, the rate constant remains same. Thus, the rate



constant for the given reaction is

$$g_{\text{inside}} = \frac{Gmr}{R^3}$$
$$= \left(\frac{Gr}{R^3}\right) \left(\frac{kv}{r}\right)$$
$$= \frac{Gkv}{R^3}$$

40. The relation between gold number and protective power is given by,

$$\frac{Gkv}{R^3}$$

This implies that gelatin proves to be the better protective colloid among all the given colloids.

41. The group  $g_{\text{out}} = \frac{Gm}{r^2}$  elements have ionization energy that is much higher than that of the elements if group  $F = Y\alpha_L A\Delta t$  as

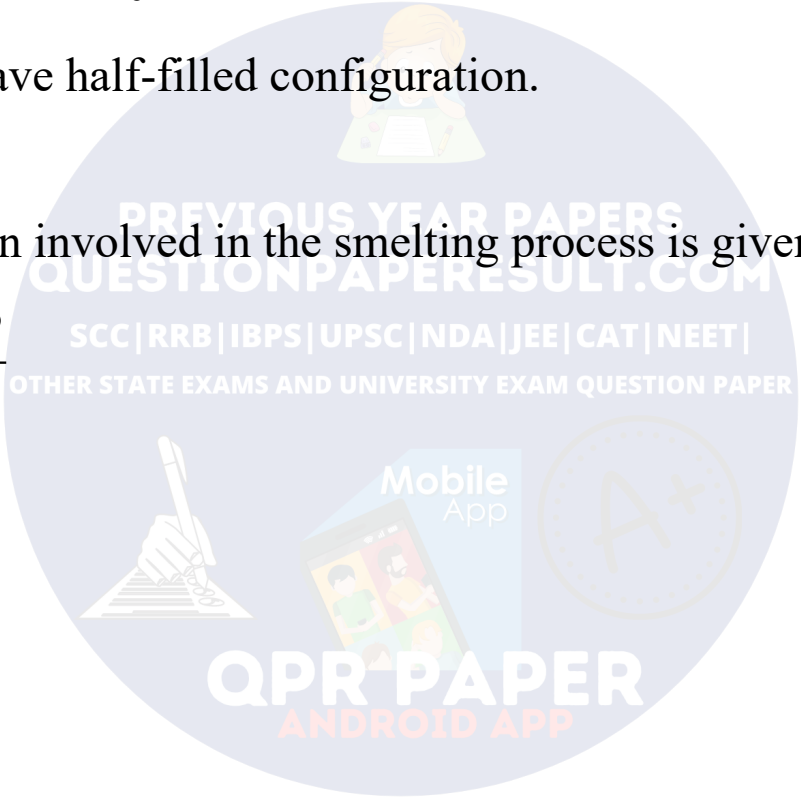
$$F = (2 \times 10^{11} \text{ Nm}^{-2})(1.2 \times 10^{-5} \text{ K}^{-1})(40 \times 10^{-4} \text{ m}^2)(10)$$

$$\begin{aligned} \text{the group} &= 9.6 \times 10^4 \text{ N} \\ &= 1 \times 10^5 \text{ N} \end{aligned}$$

elements have half-filled configuration.

42. The reaction involved in the smelting process is given by,

$$Q = \frac{\pi r^4}{8\eta} \frac{\Delta P}{L}$$





$$\frac{P_1 r_1^4}{l_1} = \frac{P_2 r_2^4}{l_2}$$

$$\frac{P_1 r_1^4}{l_1} = \frac{4P_1 r_2^4}{\frac{l_1}{4}}$$

In this process, forms the flux and  $u_{\text{initial}} = \frac{5}{2} NRT$

$$r_2^4 = \frac{r_1^4}{16}$$

$$r_2 = \frac{r_1}{2}$$

forms the gangue which results in the formation of

$$u_{\text{final}} = \frac{3}{2}(2nRT) + \frac{5}{2}(N-n)RT$$

$$= \frac{1}{2}nRT + \frac{5}{2}NRT$$

$$U_{\text{total}} = \frac{1}{2}nRT + \frac{5}{2}NRT - \frac{5}{2}NRT$$

43. Lithium hydride reacts with

$$= \frac{1}{2}nRT$$

and the reaction is expressed as follows,

$$a = a_0 e^{\frac{-bt}{m}}$$

The above reaction proves that the liberation of hydrogen gas is not possible.

44. Calcium oxide has the chemical formula  $E \propto a^2$  and is  
 $a \propto E$

commercially called quick lime.

45. Diamond has carbon atoms that are bonded via a covalent bond to four other carbon atoms in a tetrahedral manner. The

hybridization of carbon atom in diamond is  $a = \frac{a_0}{\sqrt{2}} = \frac{bt}{m}$   
 $\frac{a_0}{\sqrt{2}} = \frac{bt}{m}$  . In

$$= \frac{10^{-2}t}{0.1}$$

$$= \frac{t}{10}$$

diamond, carbon utilizes its unpaired electrons in the formation of the bond. Therefore, it is a poor conductor of electricity.

A trigonal geometry is obtained when a carbon atom in graphite is bonded via a covalent bond to three other carbon atoms. The

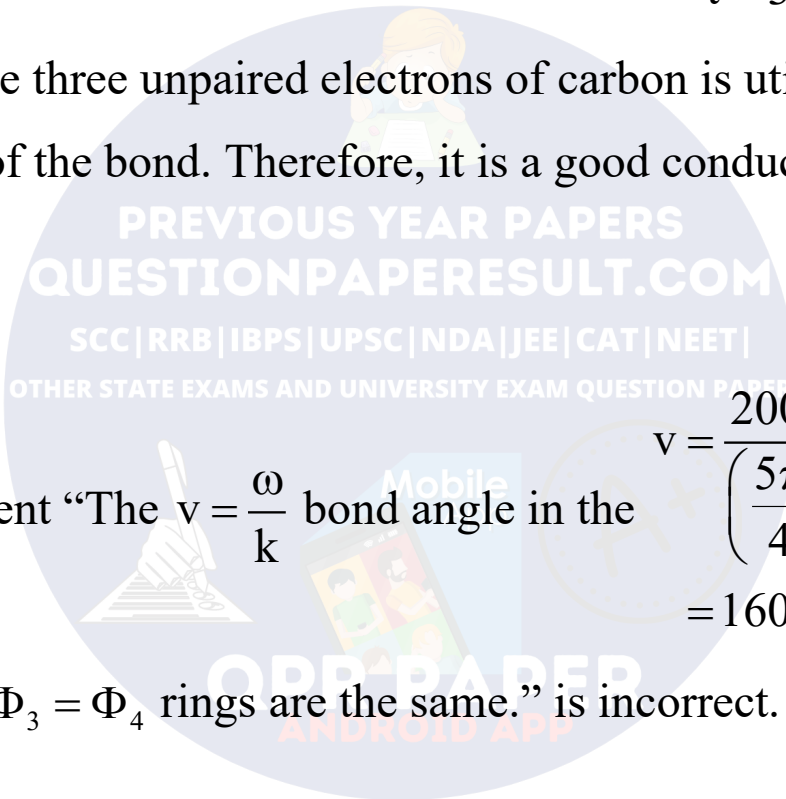
$$\frac{a_0}{\sqrt{2}} = a_0 e^{-\frac{t}{10}}$$

hybridization of carbon atom in graphite is  $\frac{1}{\sqrt{2}} = e^{-\frac{t}{10}}$ . In

$$\ln \sqrt{2} = \frac{t}{10}$$

$$t = 3.5 \text{ sec}$$

graphite, the three unpaired electrons of carbon is utilized in the formation of the bond. Therefore, it is a good conductor of electricity.



46. The statement “The  $v = \frac{\omega}{k}$  bond angle in the  $\left(\frac{5\pi}{4}\right)$  and  $= 160 \text{ m/s}$  and

$\Phi_1 = \Phi_2 = \Phi_3 = \Phi_4$  rings are the same.” is incorrect.

Both  $C = \frac{\epsilon_0 A}{3}$  and  $C = \frac{\left(\frac{k\epsilon_0 A}{3}\right)\left(\frac{\epsilon_0 A}{2.4}\right)}{\frac{k\epsilon_0 A}{3} + \frac{\epsilon_0 A}{2.4}}$  molecule have the same

bond length but different bond angles. The

$$\frac{\epsilon_0 A}{3} = \frac{\left(\frac{k\epsilon_0 A}{3}\right)\left(\frac{\epsilon_0 A}{2.4}\right)}{\frac{k\epsilon_0 A}{3} + \frac{\epsilon_0 A}{2.4}}$$

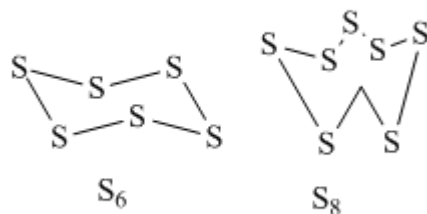
$$3k = 2.4k + 3$$

$$k = 5$$

molecule has a puckered ring with crown

conformation, whereas  $\frac{(A - C)}{D}$  molecule has a chair

conformation as shown below.



47. The statement “corrosion of iron can be minimized by forming an impermeable barrier at its surface.” is correct.
48. Those complexes that contain only one type of ligand that are bound to the central metal atom are termed as Homoleptic complexes. Therefore, the complex  $MnR^2t$  is a homoleptic complex that has six ammonia ligands bound to the central metal atom cobalt.

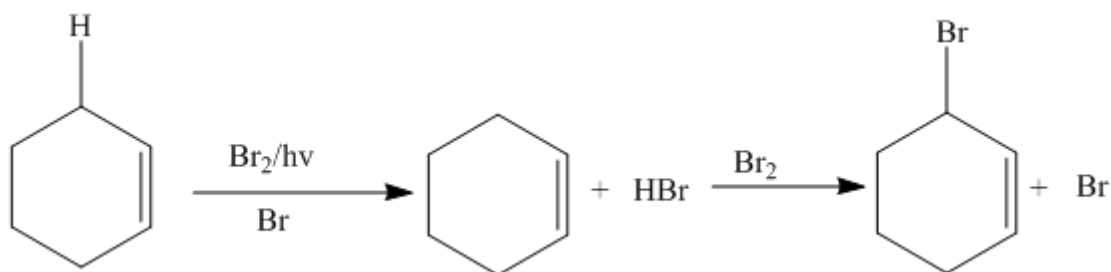
49. The transition metal ions  $-4500 \text{ J}$  is responsible for color in ruby and emerald.

Aluminum oxide is also known as ruby. It consists of chromium ions. Each aluminum and chromium ion is surrounded by six oxide ions in an octahedral manner. Emerald is composed of beryllium aluminum silicate in which chromium ions is surrounded by six silicate ions. Thus, in both the cases, chromium is responsible for color.

50. The use of carbon dioxide in dry cleaning does not increase environmental pollution and thus is considered as a better strategy to control environmental pollution. On the other hand, the substances such as tetrachloroethylene, sulfur dioxide and nitrogen dioxide on being used in dry cleaning, pollute the environment because of which their use is not a better strategy. Thus, carbon dioxide is the substance which can be used in dry cleaning to control environmental pollution.

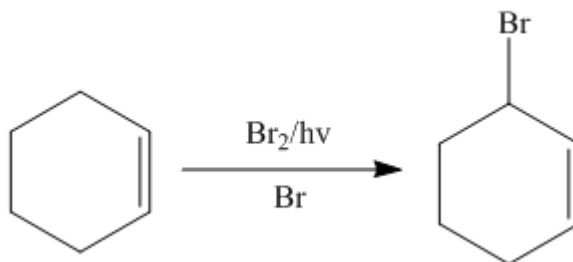
51. Sodium cyanide or sodium sulphide is formed during the fusion process and they interfere with the testing of halogens. In order to prevent this, nitric acid is used to decompose both sodium cyanide or sodium sulphide.

52. The given reaction follows the mechanism as shown below.

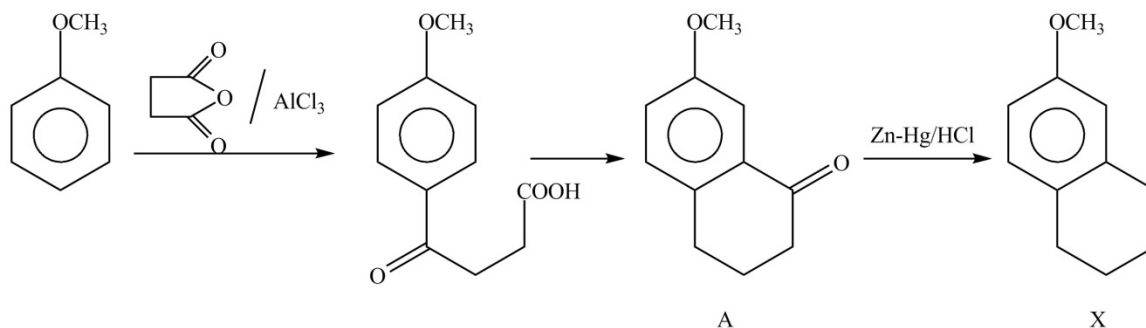


This reaction undergoes free radical substitution.

In case of bromination of cyclohexene in the presence of light, the product formed is shown below.



53. The complete sequence of reaction is given below.



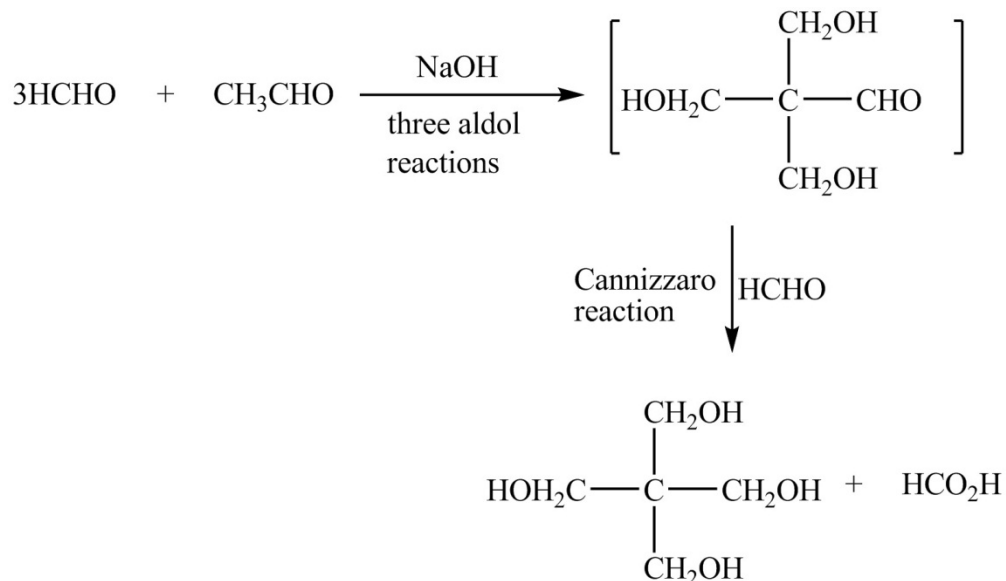
54. The given conversion is carried out in the absence of 1.37.

Bromopropane reacts with  $F_G = \frac{GMm}{(R+h)^2}$  and yields

iodopropane.

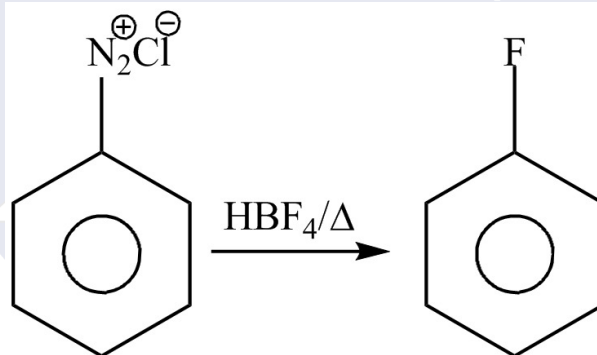
$(4\pi\mu Bb)\Delta n$

55. The synthesis of erythritol  $1.67 \times 10^5$  J involves first three aldol reactions between formaldehyde and acetaldehyde and then one Cannizzaro reaction with formaldehyde. It can be expressed as,



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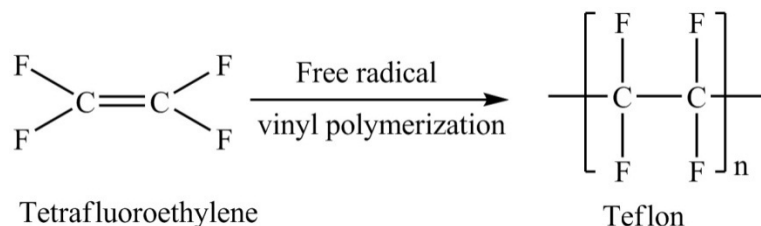
56. An aromatic ring undergoes fluorination reaction under the following reaction.



Heat is necessary for the reaction to take place. Thus, the first condition is correct for the given reaction.



57. The free radical polymerization of tetrafluoroethylene synthesizes Teflon. This polymerization is a type of vinyl polymerization and proceeds via free radical mechanism.

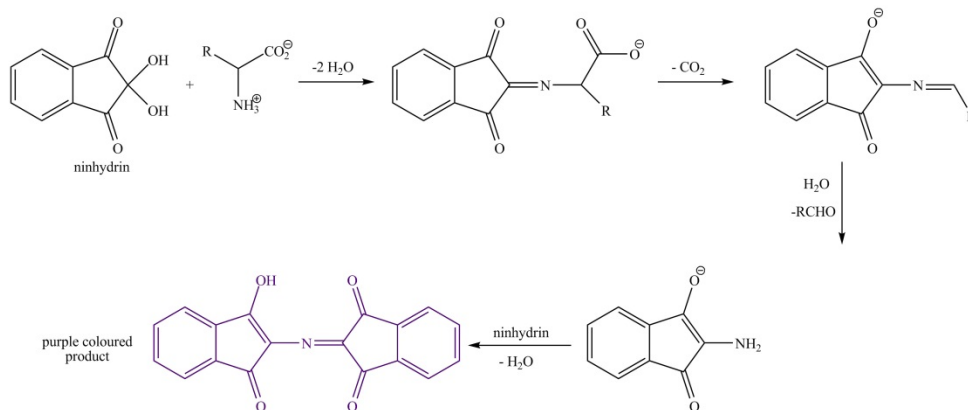


Thus, out of all the given polymers, Teflon is the only polymer which is synthesized using free radical polymerization.

58. Nitrogen number 1.9 Hz has a lone pair of electrons which is involved in the resonance and is thus involved in basicity also.

59. Ofloxacin is a bactericidal antibiotic. On the other hand, erythromycin, tetracycline and chloramphenicol are bacteriostatic antibiotic.

60. The Ninhydrin test helps in detecting the presence of 170 Hz.



The purple colored product is also known as “Rhumann’s purple”.

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# Answer keys

1	2	19	3	37	3	55	3	73	3
2	1	20	2	38	4	56	1	74	2
3	*	21	2	39	1	57	1	75	2
4	3	22	4	40	1	58	2	76	1
5	2	23	3	41	3	59	4	77	1
6	4	24	2	42	2	60	3	78	1
7	4	25	4	43	4	61	4	79	3
8	1	26	3	44	4	62	1	80	2
9	4	27	3	45	1	63	4	81	4
10	4	28	2	46	4	64	3	82	4
11	4	29	1	47	4	65	4	83	2
12	3	30	1	48	1	66	1	84	4
13	2	31	2	49	4	67	1	85	4
14	*	32	2	50	2	68	1	86	2
15	1	33	1	51	3	69	2	87	3
16	2	34	1	52	2	70	4	88	3

17	2	35	2	53	4	71	1	89	4
18	1	36	2	54	4	72	2	90	4



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