

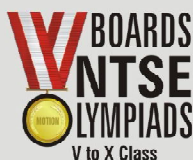
हमारा विश्वास... हर एक विद्यार्थी है स्वास

**JEE
MAIN
JAN
2020**

PAPER WITH SOLUTION

9th January 2020 _ SHIFT - 2

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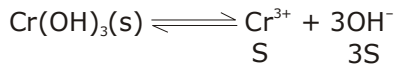
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1. The solubility product of Cr(OH)_3 at 298 K is 6.0×10^{-31} . The concentration of hydroxide ions in a saturated solution of Cr(OH)_3 will be:
 (1) $(4.86 \times 10^{-29})^{1/4}$ (2) $(18 \times 10^{-31})^{1/2}$ (3) $(18 \times 10^{-31})^{1/4}$ (4) $(2.22 \times 10^{-31})^{1/4}$
1. 298 K पर, Cr(OH)_3 का विलेयता गुणांक 6.0×10^{-31} है। Cr(OH)_3 के एक संतप्त विलयन में हाइड्रॉक्साइड आयन की सांद्रता होगी:
 (1) $(4.86 \times 10^{-29})^{1/4}$ (2) $(18 \times 10^{-31})^{1/2}$ (3) $(18 \times 10^{-31})^{1/4}$ (4) $(2.22 \times 10^{-31})^{1/4}$

Sol. 3



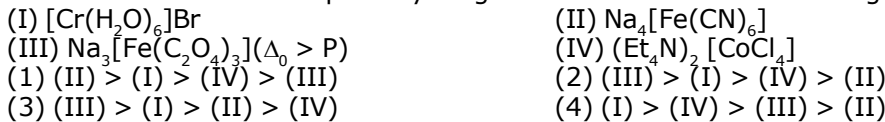
$$K_{\text{sp}} = 27\text{S}^4 = 6 \times 10^{-31}$$

$$\text{S}^4 = \frac{6}{27} \times 10^{-31}$$

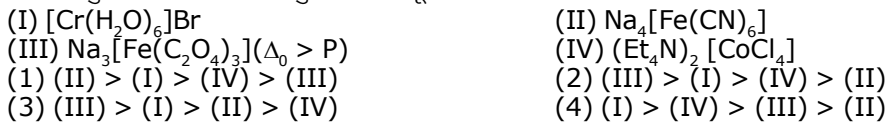
$$\text{S} = \left\{ \frac{2}{9} \times 10^{-31} \right\}^{1/4}$$

$$[\text{OH}^-] = 3\text{S} = \left\{ \frac{2}{9} \times 10^{-31} \right\}^{1/4} \times 3 = \left\{ 18 \times 10^{-31} \right\}^{1/4}$$

2. The correct order of the spin only magnetic moments of the following complexes is:

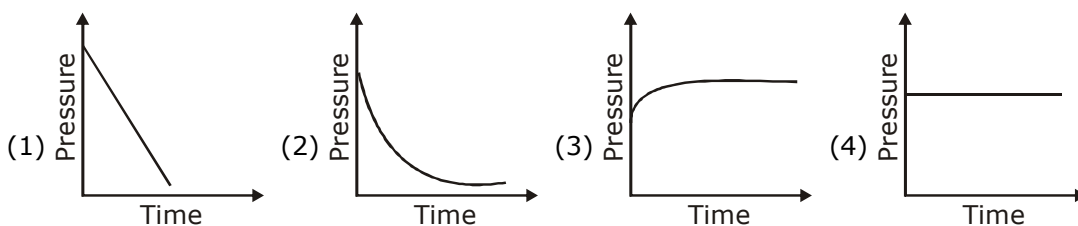


2. निम्न संकुलों के केवल चक्रण चुम्बकीय आघूर्णों के मानों का सही क्रम है :

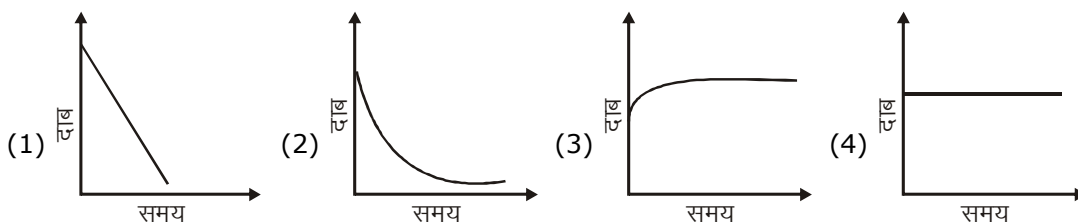


Sol. 4

3. A mixture of gases O_2 , H_2 and CO are taken in a closed vessel containing charcoal. The graph that represents the correct behaviour of pressure with time is:



4. O_2 , H_2 तथा CO गैसों के एक मिश्रण को एक बन्द पात्र में लिया जाता है जिसमें चारकोल है। आलेख जो, दाब का समय के सभ्य सही व्यवहार निरूपित करता है, है:



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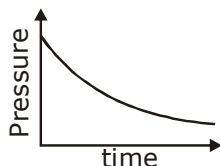
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Sol. 3



$$p = K(x/m)^{1/n}$$

As 'x' increases

'p' decreases

4. The number of sp^2 hybrid orbitals in a molecule of benzene is:

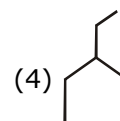
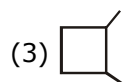
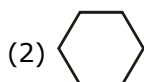
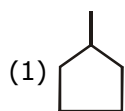
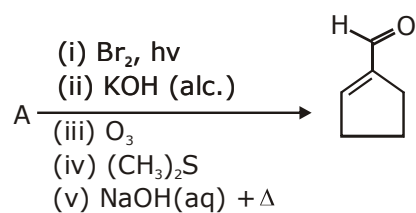
(1) 18 (2) 12 (3) 6 (4) 24

4. बेन्जीन के एक अणु में sp^2 संकर कक्षकों की संख्या है :

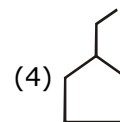
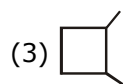
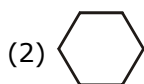
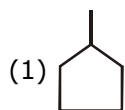
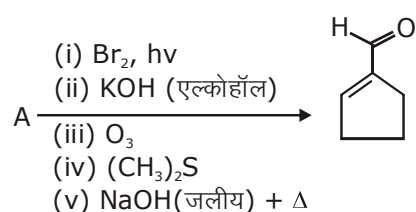
(1) 18 (2) 12 (3) 6 (4) 24

Sol. 1

5. In the following reaction A is:



5. निम्नलिखित अभिक्रिया में A है :



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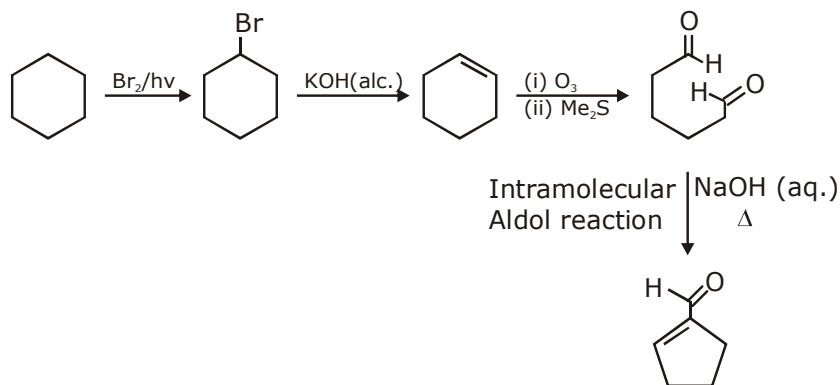
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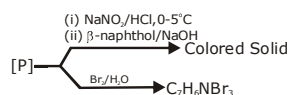
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Sol. 2

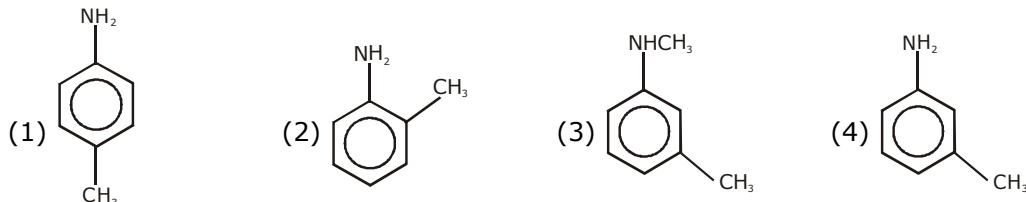


So, the answer should be 2

6. Consider the following reactions,



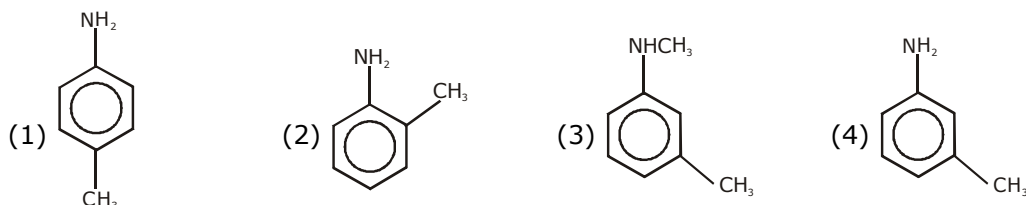
The compound [P] is :



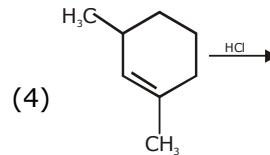
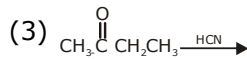
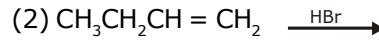
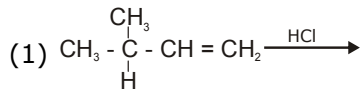
6. निम्नलिखित अभिक्रियाओं पर विचार कीजिए,



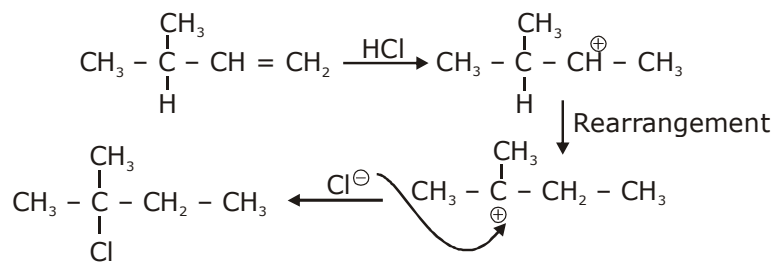
यौगिक [P] है :



9. निम्नलिखित अभिक्रियाओं में से कौन एक रैसिमिक उत्पाद नहीं देगी ?



Sol. 1



So, the answer should be 1

10. Biochemical Oxygen Demand (BOD) is the amount of oxygen required (in ppm) :
- (1) By anaerobic bacteria to breakdown inorganic waste present in a water body.
 - (2) For the photochemical breakdown of waste present in 1 m³ volume of a water body.
 - (3) by bacteria to break-down organic waste in a certain volume of a water sample.
 - (4) for sustaining life in a water body.

10. जैवरासायनिक ऑक्सीजन माँग (BOD) आवश्यक ऑक्सीजन की मात्रा (ppm में) है :
- (1) अवायवीय बैक्टीरिया द्वारा एक जलाशय में उपस्थित अकार्बनिक अपशिष्ट के भंजन के लिए।
 - (2) एक जलाशय के 1 m³ आयतन में उपस्थित अपशिष्ट के प्रकाशरासायनिक भंजन के लिए।
 - (3) एक जल-प्रतिदर्श के एक निश्चित आयतन में बैक्टीरिया द्वारा कार्बनिक अपशिष्ट के भंजन के लिए।
 - (4) एक जलाशय में जीवन को दीर्घकालीन बनाने के लिए।

Sol. Wrong

Option 1 can be right if inorganic waste is replaced by organic waste.

11. A, B and C are three biomolecules. The result of the tests performed on them are given below :

	Molish's Test	Barfoed Test	Biuret Test
A	Positive	Negative	Negative
B	Positive	Positive	Negative
C	Negative	Negative	Positive

A, B and C are respectively :

- (1) A = Lactose, B = Fructose, C = Alanine
- (2) A = Lactose, B = Glucose, C = Albumin
- (3) A = Lactose, B = Glucose, C = Alanine
- (4) A = Glucose, B = Fructose, C = Albumin

11. A, B तथा C तीन जैवअणु है। उनपर किये गये परीक्षणों का परिणाम नीचे दिये गये है :

	मोलिश परीक्षण	बारफोर्ड परीक्षण	बाइयूरेट परीक्षण
A	सकारात्मक	नकारात्मक	नकारात्मक
B	सकारात्मक	सकारात्मक	नकारात्मक
C	नकारात्मक	नकारात्मक	सकारात्मक

A, B तथा C क्रमशः हैं :

- (1) A = लैक्टोस, B = फ्रुक्टोज, C = ऐलानिन
 (2) A = लैक्टोस, B = ग्लूकोस, C = ऐल्बुमिन
 (3) A = लैक्टोस, B = ग्लूकोस, C = ऐलानिन
 (4) A = ग्लूकोस, B = फ्रुक्टोज, C = ऐल्बुमिन

Sol. 2

Lactose, Glucose and Fructose give +ve motisch's test.
 Glucose give +ve barfoed test and fructose give -ve barfoed test.
 Albumin give the biuret test and alamine give -ve Biuret test.
 So, the answer should be 2.

12. 5 g of zinc is treated separately with an excess of

- (a) dilute hydrochloric acid and.
 (b) aqueous sodium hydroxide.

The ratio of the volumes of H₂ evolved in these two reactions is :

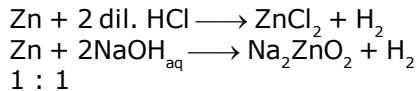
- (1) 2 : 1 (2) 1 : 1 (3) 1 : 2 (4) 1 : 4

5 g जिंक को अलग-अलग

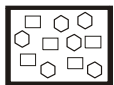
- (a) तनु हाइड्रोक्लोरिक अम्ल तथा
 (b) जलीय सोडियम हाइड्रॉक्साइड के आधिक्य के साथ अभिक्रियित किया जाता है।
 इन दोनों अभिक्रियाओं में उत्सर्जित H₂ के आयतनों का अनुपात है :

- (1) 2 : 1 (2) 1 : 1 (3) 1 : 2 (4) 1 : 4

Sol. 2

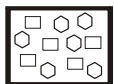


13. In the figure shown below reactant A (represented by square) is in equilibrium with product B (represented by circle). The equilibrium constant is :



- (1) 2 (2) 4 (3) 8 (4) 1

13. नीचे दिये गये आकृति में, अभिकारक A (वर्ग द्वारा निरूपित) उत्पाद B (वृत्त द्वारा निरूपित) के साथ साम्यावस्था में है। साम्य नियतांक है :



- (1) 2 (2) 4 (3) 8 (4) 1

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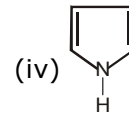
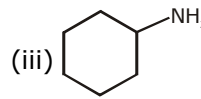
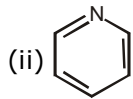
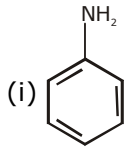
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Sol. 1

$$K_{eq} = \frac{[B]}{[A]} = \frac{11}{6} = \frac{12}{6} = 2$$

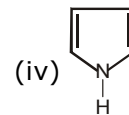
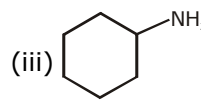
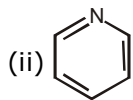
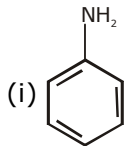
14. The decreasing order of basicity of the following amines is :



(1) (I) > (III) > (IV) > (I)
(3) (III) > (I) > (II) > (IV)

(2) (III) > (II) > (I) > (IV)
(4) (II) > (III) > (IV) > (I)

14. निम्नलिखित ऐमीनों की क्षारकता का घटता क्रम है :

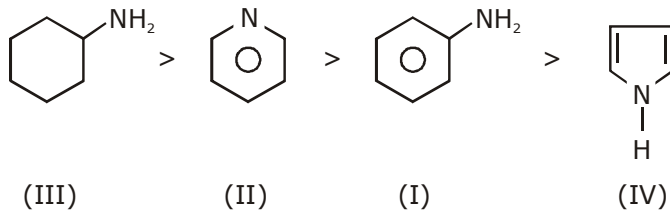


(1) (I) > (III) > (IV) > (I)
(3) (III) > (I) > (II) > (IV)

(2) (III) > (II) > (I) > (IV)
(4) (II) > (III) > (IV) > (I)

Sol. 2

Correct order of basicity is



So, the answer should be 2

15. The true statement amongst the following is :

- (1) S is a function of temperature but ΔS is not a function of temperature.
- (2) Both ΔS and S are functions of temperature.
- (3) Both S and ΔS are not functions of temperature.
- (4) S is not a function of temperature but ΔS is a function of temperature.

15. निम्नलिखित कथनों में से सही कथन है :

- (1) S ताप का एक फलन है परन्तु ΔS ताप का एक फलन नहीं है।
- (2) दोनों ΔS तथा S ताप के फलन है।
- (3) दोनों S तथा ΔS ताप के फलन नहीं है।
- (4) S ताप का एक फलन नहीं है परन्तु ΔS ताप का एक फलन है।

Sol. 2

$$\Delta S = \int \frac{dq_{\text{Rew}}}{T}$$

$$S = K \ln(w)$$

Both are dependent on temperature.

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16. The isomer(s) of $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]$ that has/have a Cl - Co - Cl angle of 90° is/are :
 (1) cis and trans (2) trans only
 (3) cis only (4) meridonal and trans

16. $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]$ का समावयवी जो 90° का एक Cl - Co - Cl कोण रखता है :
 (1) समपक्ष तथा विपक्ष (2) केवल विपक्ष
 (3) केवल समपक्ष (4) दक्षिणात्य तथा विपक्ष

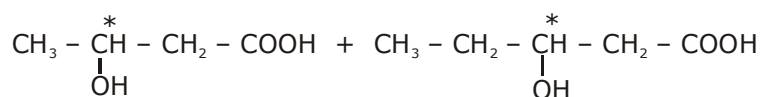
Sol. 3

17. Which polymer has chiral monomer(s) ?
 (1) Buna - N (2) Neoprene (3) Nylone 6,6 (4) PHBV

17. कौनसा बहुलक किरेल एकलक रखता है ?
 (1) ब्यूना - N (2) निओप्रिन (3) नायलॉन 6,6 (4) PHBV

Sol. 4

Monomer of PHBV is:



(2-Hydroxy butanoic acid) (3-Hydroxy butanoic acid)

So, the answer should be 4

18. Amongst the following, the form of water with the lowest ionic conductance at 298 K is :
 (1) water from a well
 (2) sea water
 (3) saline water used for intravenous injection
 (4) distilled water

18. 298 K पर वह जल का प्ररूप, जिसकी आयनिक चालकता सबसे कम हो, निम्नलिखित में से है :
 (1) कुँए का जल
 (2) समुद्र जल
 (3) लवण जल जिसका अंतःशिरा इन्जेक्शन में प्रयुक्त होता है।
 (4) आसवित जल

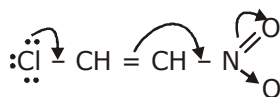
Sol. 4

Distilled water

19. Which of the following has the shortest C - Cl bond ?
 (1) Cl - CH = CH - OCH₃ (2) Cl - CH = CH - NO₂
 (3) Cl - CH = CH₂ (4) Cl - CH = CH - CH₃

19. निम्नलिखित में से किसमें सबसे छोटा C - Cl आबंध है ?
 (1) Cl - CH = CH - OCH₃ (2) Cl - CH = CH - NO₂
 (3) Cl - CH = CH₂ (4) Cl - CH = CH - CH₃

Sol. 2



Resonance form of Cl - CH = CH - NO₂ is more stable than resonance form of any other given compounds. Hence, double bond characters in C - Cl bond is maximum and bond length is shortest.

So, the answer should be 2

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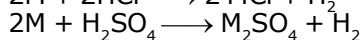
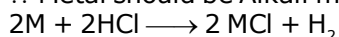
20. The first and second ionisation enthalpies of a metal are 496 and 4560 KJ mol⁻¹ respectively. How many moles of HCl and H₂SO₄, respectively, will be needed to react completely with 1 mole of the metal hydroxide ?
 (1) 1 and 2 (2) 1 and 1 (3) 2 and 0.5 (4) 1 and 0.5
20. एक धातु की प्रथम तथा द्वितीय आयतन एन्थैल्पियाँ क्रमशः 496 तथा 4560 KJ mol⁻¹ हैं। एक मोल धातु हाइड्रॉक्साइड से पूर्णतया अभिक्रिया के लिए HCl तथा H₂SO₄, के कितने मोलों की आवश्यकता होगी ?
 (1) 1 तथा 2 (2) 1 तथा 1 (3) 2 तथा 0.5 (4) 1 तथा 0.5

Sol. 4

$$1E_{1st} = 496$$

$$1E_{2nd} = 4560$$

∴ Metal should be Alkali metal

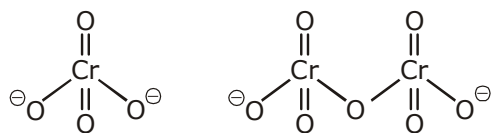


For 1 mol of metal, 1 mol HCl required & 1/2 mol H₂SO₄ required

21. The sum of the total number of bonds between chromium and oxygen atoms in chromate and dichromate ions is

21. क्रोमेट तथा डाइक्रोमेट में क्रोमियम तथा ऑक्सीजन के बीच आबंधों की कुल संख्याओं का योग है

Sol. 12



Ans 12

22. A sample of milk splits after 60 min at 300K and after 40 min. at 400 K when the population of lactobacillus acidoplulus in it doubles. The activation energy (in kj/mol) for this process is close to

(Given $R = 8.3 \text{ J mol}^{-1}\text{K}^{-1}$, $\ln\left(\frac{2}{3}\right) = 0.4$, $e^{-3} = 4.0$).

22. जल लैक्टोबैसिलस एसिडोफिलस, की आबादी दुगुनी होती है तो दूध का एक प्रतिदर्श 300 K पर 60 मिनट के बाद तथा 400 K पर 40 मिनट के बाद विपाटित होता है। इस प्रक्रम के लिए सक्रियण ऊर्जा (kj/mol में) लगभग है _____.

(दिया गया है : $R = 8.3 \text{ J mol}^{-1}\text{K}^{-1}$, $\ln\left(\frac{2}{3}\right) = 0.4$, $e^{-3} = 4.0$).

Sol. **Ea = 3.984 KJ/mol**

$$\text{rate}_{300\text{K}} = \frac{1}{60}$$

$$\text{rate}_{400\text{K}} = \frac{1}{40}$$

$$\ln\left\{\frac{K_{400}}{K_{300}}\right\} = \frac{Ea}{R} \left\{\frac{1}{300} - \frac{1}{400}\right\}$$

$$\ln\left\{\frac{60}{40}\right\} = \frac{Ea}{R} \left\{\frac{4-3}{1200}\right\}$$

$$Ea = 0.4 \times 8.3 \times 1200$$

$$Ea = 332 \times 12$$

$$Ea = 3984 \text{ J/mol}$$

$$Ea = 3.984 \text{ KJ/mol}$$

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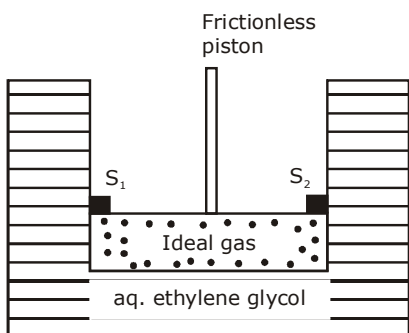
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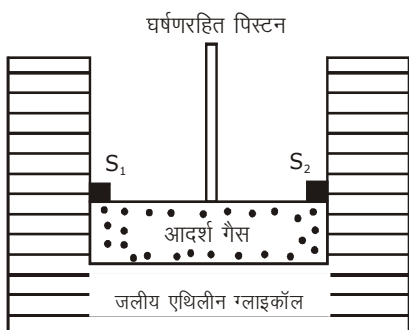
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23. A cylinder containing an ideal gas 0.1 mol of 1.0 dm^3 is in thermal equilibrium with a large volume of 0.5 molal aqueous solution of ethylene glycol at its freezing point. If the stoppers S_1 and S_2 (as shown in the figure) are suddenly withdrawn, the volume of the gas in litres after equilibrium is achieved will be
(Given, $K_f(\text{water}) = 2.0 \text{ K Kg mol}^{-1}$ $R = 0.08 \text{ dm}^3 \text{ atm K}^{-1} \text{ mol}^{-1}$)



23. एक सिलिन्डर जिसमें एक आदर्श गैस (0.1 dm^3 का 0.1 मोल) हैं, हिमांक ताप पर एथिलीन ग्लाइकोल के 0.5 मोलल विलयन के साथ तापीय साम्यावस्था में है। यदि S_1 तथा S_2 स्टॉपर्स (आकृति में जिस प्रकार दर्शाया गया है) को एकाएक हटा लिया गया है, तो साम्यावस्था प्राप्ति के बाद गैस का आयतन लीटन में होगा _____।
(दिया गया है, $K_f(\text{जल}) = 2.0 \text{ K Kg mol}^{-1}$ $R = 0.08 \text{ dm}^3 \text{ atm K}^{-1} \text{ mol}^{-1}$)



- Sol.** 2.176 dm^3
 $\Delta t_f = K_f \times m = 2 \times 0.5 = 1$
 $T_{\text{initial}} = 272 \text{ K}$
 $P_1 V_1 = P_2 V_2$
 $V_2 = \frac{0.1 \times 0.08 \times 272}{1} = 2.176 \text{ dm}^3$

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Fees - ₹ 0
score above 240

24. 10.30 mg of O₂ is dissolved into a litre of sea water of density 1.03 g/mL. the concentration of O₂ in ppm is _____ |

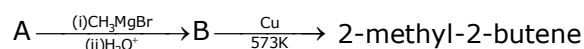
24. O₂ के 10.30 mg को 1.03 g/mL घनत्व वाले समुद्र जल के एक लीटर में घोला जाता है। O₂ की ppm में सांद्रता है _____ |

Sol. 10 ppm

1030 gm of sea water contains = 10.3×10^{-3} gm

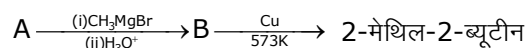
10⁶ gm of sea water contains = $\frac{10.3 \times 10^{-3}}{1030} \times 10^6 = 10$ ppm

25. Consider the following reactions



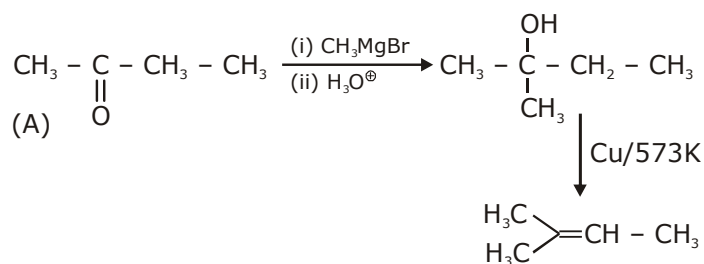
The mass percentage of carbon in A is

25. निम्नलिखित अभिक्रिया पर विचार कीजिए



A में कार्बन का द्रव्यमान प्रतिशत है _____ |

Sol. 66.67%



M. F. of (A) is (C₄H₈O)

Mass % of C would be = $\frac{48}{72} \times 100 = 66.67\%$

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