

JEE Main September 2020
Question Paper With Text Solution
2 September| Shift-1

CHEMISTRY

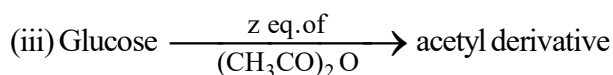
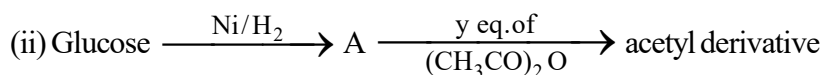


JEE Main & Advanced | XI-XII Foundation| VI-X Pre-Foundation

Office : Piprali Road, Sikar (Raj.) | Ph. 01572-241911
Website : www.matrixedu.in ; Email : smd@matrixacademy.co.in

JEE MAIN SEP 2020 | 2 SEP SHIFT-1

1. Consider the following reactions :



'x', 'y' and 'z' in these reaction are respectively.

(1) 5, 6 & 5

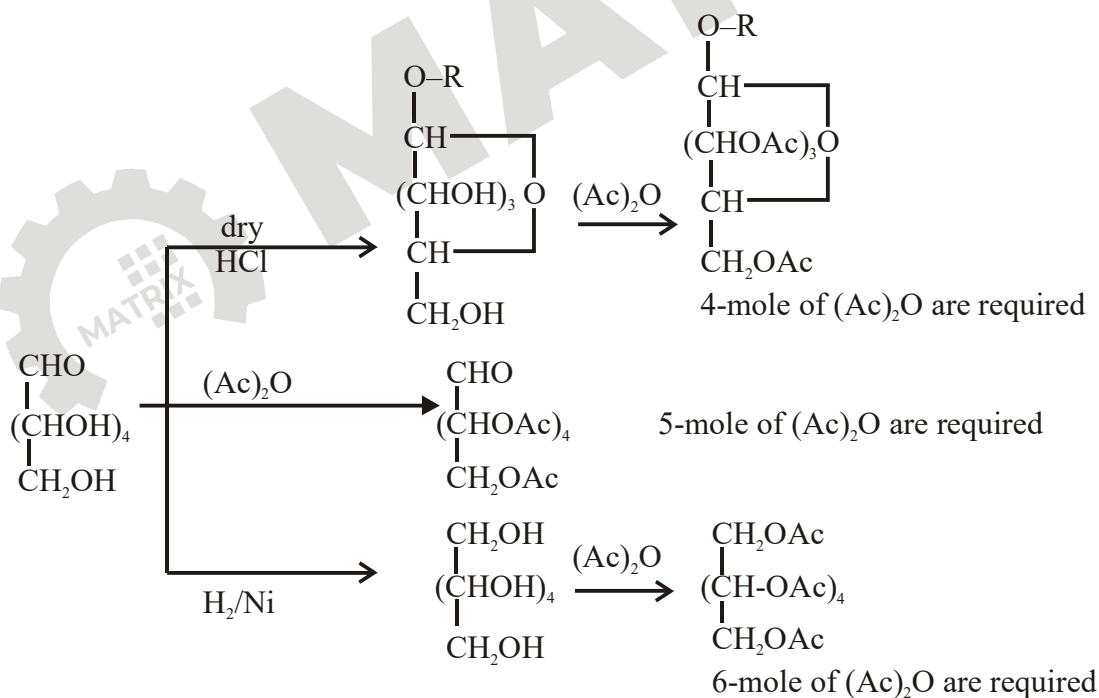
(2) 4, 6 & 5

(3) 5, 4 & 5

(4) 4, 5 & 5

Ans. (2)

Sol.



2. If AB_4 molecule is a polar molecule, a possible geometry of AB_4 is :

- (1) Rectangular planar (2) Tetrahedral
(3) square planar (4) Square pyramidal

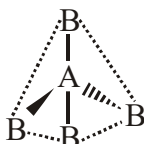
Ans. (4)

Sol. (1) Rectangular Planar



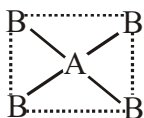
Non Polar

(2) Tetrahedral



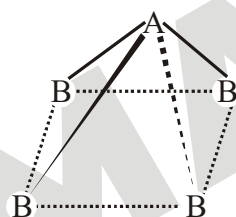
Non Polar

(3) Square Planar



Non Polar

(4) Square Pyramidal



Polar

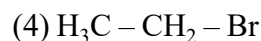
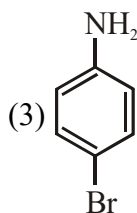
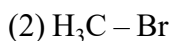
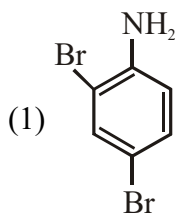
3. Which of the following is used for the preparation of colloids ?

- (1) Ostwald Process (2) Bredig's Arc Method
(3) Van Arkel Method (4) Mond Process

Ans. (2)

Sol. In this method electric arc is struck between electrodes of the metal immersed in the dispersion medium. The intense heat produced vapourises the metal, which then condensed to form particles of colloidal size.

4. In Carius method of estimation of halogen, 0.172 g of an organic compound showed presence of 0.08 g of bromine. Which of these is the correct structure of the compound ?

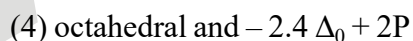
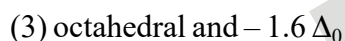
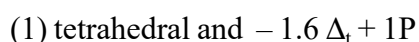


Ans. (3)

Sol. % of Bromine in compound = $\frac{0.08}{0.172} \times 100 = 46.5$

this percentage is present in $\text{NH}_2\text{-Ph-Br}$ for bromine = $\frac{80}{172} \times 100 = 46.5$

5. Consider that d^6 metal ion (M^{2+}) forms a complex with aqua ligands, and the spin only magnetic moment of the complex is 4.90 BM. The geometry and the crystal field stabilization energy of the complex is :



Ans. (2)

Sol. $\mu = 4.90 \text{ BM}$

No. of unpaired $e^- = 4$

possible cases



$$M^{2+} (d^6) = e_g^{2,1} t_{2g}^{1,1,1}$$

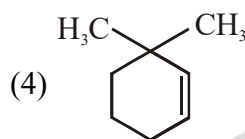
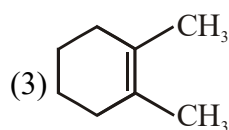
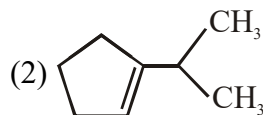
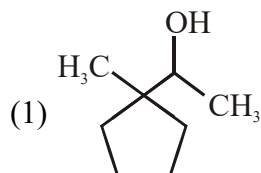
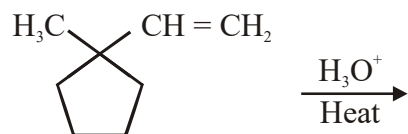
$$\text{CFSE} = -0.6\Delta_t$$



$$M^{2+} (d^6) = t_{2g}^{2,1,1} e_g^{1,1}$$

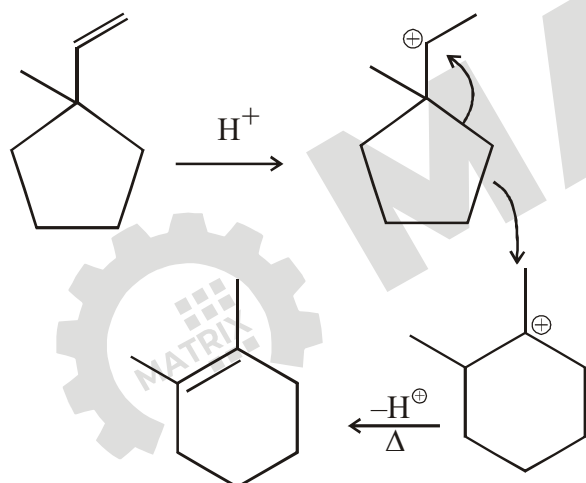
$$\text{CFSE} = -0.4\Delta_0$$

6. The major product in the following reaction is :



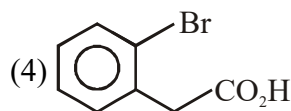
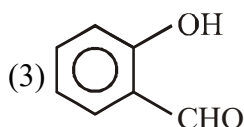
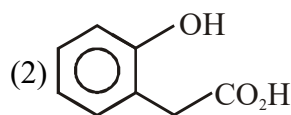
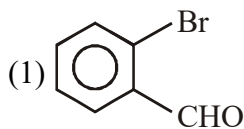
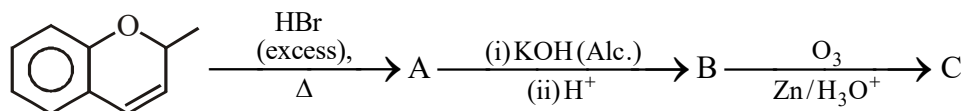
Ans. (3)

Sol.



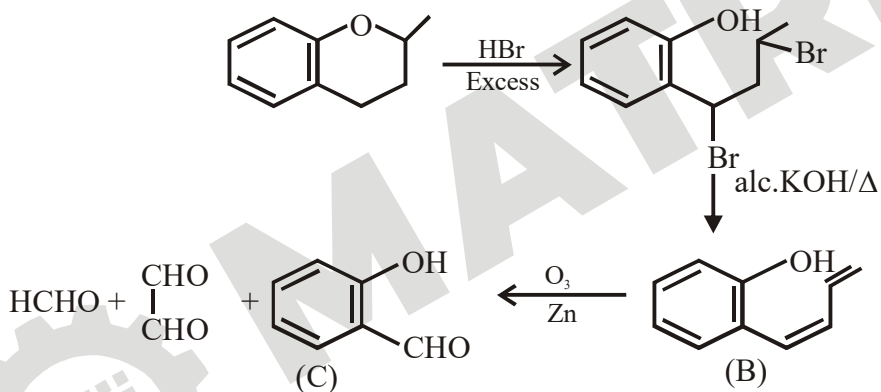


7. The major aromatic product C in the following reaction sequence will be :



Ans. (3)

Sol.



8. For the following Assertion and Reason, the correct option is :

Assertion (A) : When Cu (II) and sulphide ions are mixed, they react together extremely quickly to give a solid.

Reason (R) : The equilibrium constant of $\text{Cu}^{2+}(\text{aq}) + \text{S}^{2-}(\text{aq}) \rightleftharpoons \text{CuS}(\text{s})$ is high because the solubility product is low.

(1) Both (A) and (R) are false.

(2) Both (A) and (R) are true but (R) is not the explanation for (A).

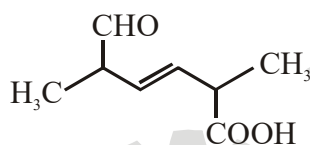
(3) (A) is false and (R) is true.

(4) Both (A) and (R) are true and (R) is the explanation for (A).

Ans. (2)

Sol. Rate of chemical reaction has nothing to do with value of equilibrium constant.

9. The IUPAC name for the following compound is :



(1) 2, 5-dimethyl-6-oxo-hex-3-enoic acid

(2) 2, 5-dimethyl-5-carboxy-hex-3-enal

(3) 2, 5-dimethyl-6-carboxy-hex-3-enal

(4) 6-formyl-2-methyl-hex-3-enoic acid

Ans. (1)

Sol. Carboxylic acid gets the first priority among the functional groups present on compound multiple bond should be present in the main chain.

10. An open beaker of water in equilibrium with water vapour is in a sealed container. When a few grams of glucose are added to the beaker of water, the rate at which water molecules :

- (1) leaves the solution decreases (2) leaves the vapour increases
(3) leaves the vapour decreases (4) leaves the solution increases

Ans. (1)

Sol. When glucose is added to the beaker of water it will decrease the rate of evaporation of water molecules which leave the solution.

11. While titrating dilute HCl solution with aqueous NaOH, which of the following will not be required ?

- (1) Pipette and distilled water (2) Bunsen burner and measuring cylinder
(3) Burette and porcelain tile (4) Clamp and phenolphthalein

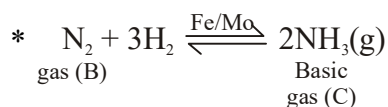
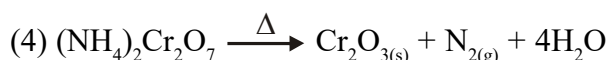
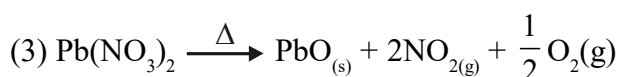
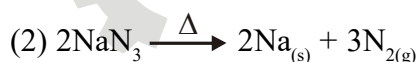
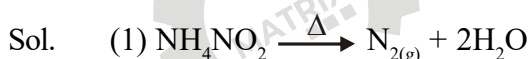
Ans. (2)

Sol. Bunsen burner is used for heating which is not applicable for above given titration.

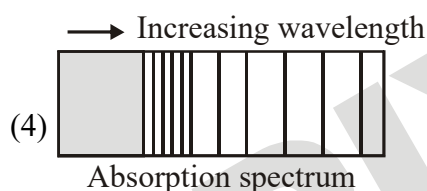
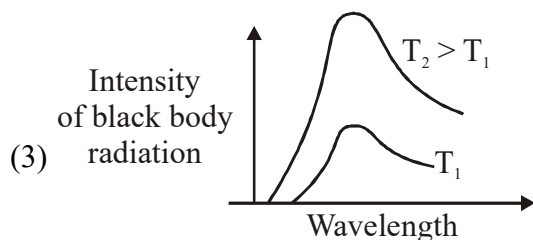
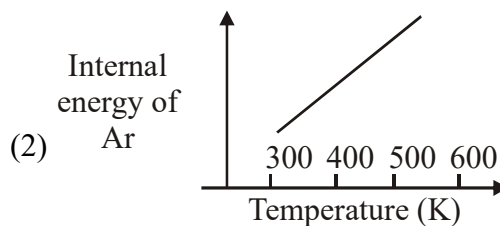
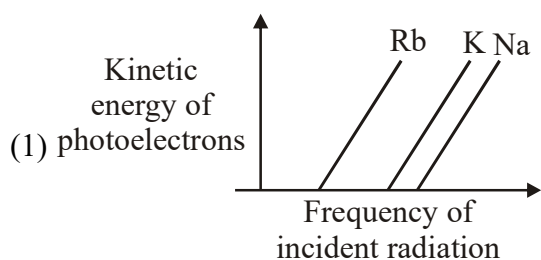
12. On heating compound (A) gives a gas (B) which is a constituent of air. This gas when treated with H_2 in the presence of a catalyst gives another gas (C) which is basic in nature. (A) should not be :

- (1) NH_4NO_2 (2) NaN_3 (3) $Pb(NO_3)_2$ (4) $(NH_4)_2Cr_2O_7$

Ans. (3)



13. The figure that is not a direct manifestation of the quantum nature of atoms is :



Ans. (2)

Sol. Kinetic energy of Argon increases with temperature according to kinetic theory of gases which has no relation with quantum nature of atoms.

14. The statement that is not true about ozone is :

(1) in the stratosphere, it forms a protective shield against UV radiation.

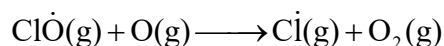
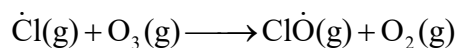
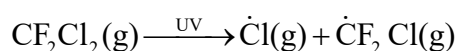
(2) in the atmosphere, it is depleted by CFCs.

(3) in the stratosphere, CFCs release chlorine free radicals (Cl) which reacts with O_3 to give chlorine dioxide radicals.

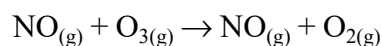
(4) it is a toxic gas and its reaction with NO gives NO_2 .

Ans. (3)

Sol. * In presence of sunlight CFC's molecule divides and release chlorine free radical which gives chlorine monoxide radical ($ClO^\bullet$) and oxygen with ozone.



* it is a toxic gas and its reaction with NO gives NO_2 .



MATRIX JEE ACADEMY

Office : Piprali Road, Sikar (Raj.) | Ph. 01572-241911

Website : www.matrixedu.in ; Email : smd@matrixacademy.co.in

15. The metal mainly used in devising photoelectric cells is :

- (1) Na (2) Cs (3) Rb (4) Li

Ans. (2)

Sol. The metals with low ionisation enthalpies are used in photoelectric cell.

16. For octahedral Mn (II) and tetrahedral Ni (II) complexes, consider the following statements :

- (I) both the complexes can be high spin.
(II) Ni (II) complex can very rarely be low spin.
(III) with strong field ligands, Mn (II) complexes can be low spin.
(IV) aqueous solution of Mn (II) ions is yellow in color.

the correct statements are :

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

Ans. (1)

Sol. (a) $[\text{Mn}^{+2}(\text{L})_6]^{\pm n}$ (L = Monodentate ligand)

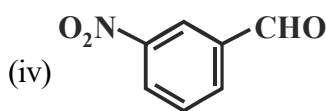
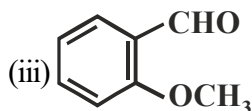
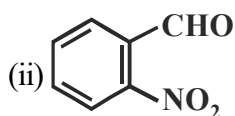
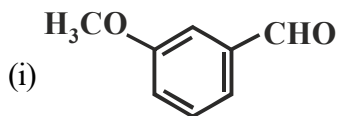
Octahedral complex, either sp^3d^2 (High spin, in presence of weak field ligand) or d^2sp^3 (Low spin, in presence of strong field ligand)

(b) $[\text{Ni}^{+2}(\text{L})_4]^{\pm n}$ (L = Monodentate ligand)

Tetrahedral complex (usually high spin complex)

* Aqueous solution of Mn(II) ions is light pink (almost colourless) in colour

17. The increasing order of the following compounds towards HCN addition is :



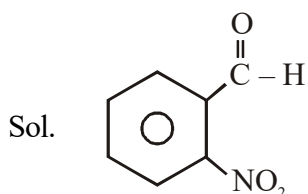
(1) (iii) < (iv) < (ii) < (i)

(2) (i) < (iii) < (iv) < (ii)

(3) (iii) < (iv) < (i) < (ii)

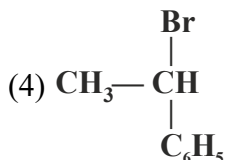
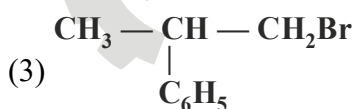
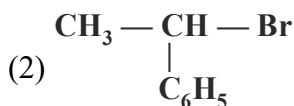
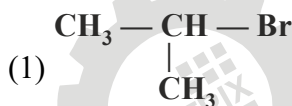
(4) (iii) < (i) < (iv) < (ii)

Ans. (4)

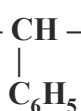


– R effect of NO₂ produces strong electrophilic centre on carbon of aldehyde group.

18. Which of the following compounds will show retention in configuration on nucleophilic substitution by OH[–] ion ?

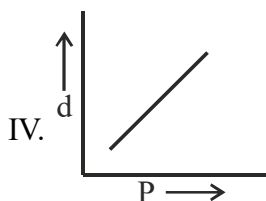
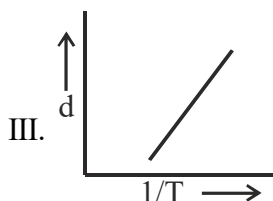
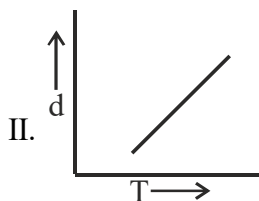
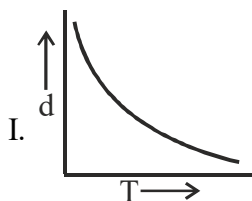


Ans. (3)

Sol. The carbon of halogen in  is not chiral and it is of primary nature.



19. Which one of the following graphs is not correct for ideal gas ?



d = Density, P = Pressure, T = Temperature

(1) IV

(2) II

(3) III

(4) I

Ans. (2)

Sol. For ideal gas

$$PM = dRT$$

$$d = \left[\frac{PM}{R} \right] \frac{1}{T}$$

So graph between d Vs T is not straight line.

$$d = \left[\frac{M}{RT} \right] P \text{ graph between } d \text{ vs } P \text{ is straight line.}$$

20. In general, the property (magnitudes only) that shows an opposite trend in comparison to other properties across a period is :

- | | |
|-----------------------|----------------------------|
| (1) Atomic radius | (2) Ionization enthalpy |
| (3) Electronegativity | (4) Electron gain enthalpy |

Ans. (1)

Sol. On moving left to Right along a period

Atomic radius $\rightarrow$ decreases

Ionisation enthalpy $\rightarrow$ Increases

Electronegativity $\rightarrow$ Increases

Electron gain enthalpy $\rightarrow$ Increases

21. The internal energy change (in J) when 90 g of water undergoes complete evaporation at 100°C is _____.

(Given : ΔH_{vap} for water at 373 K = 41 kJ/mol, $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$)

Ans. 189494

Sol. $\text{H}_2\text{O}(l) \rightarrow \text{H}_2\text{O}(g)$ (for 1 mol)

$$\Delta n_g = 1, \quad \Delta H = 41 \text{ kJ}$$

$$\Delta H = \Delta U + \Delta n_g RT$$

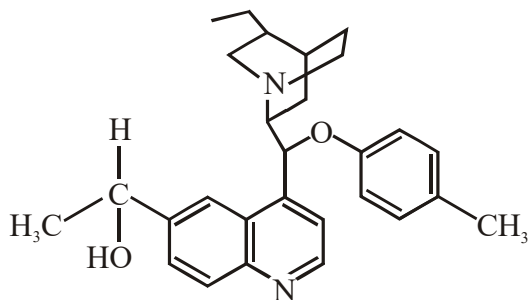
$$\Delta U = \Delta H - \Delta n_g RT = 41 - 1 \times 8.314 \times 373 \times 10^{-3}$$

$$\Delta U = 41 - 3.1 = 37.89 \text{ kJ}$$

For 90 gm water (5 mol)

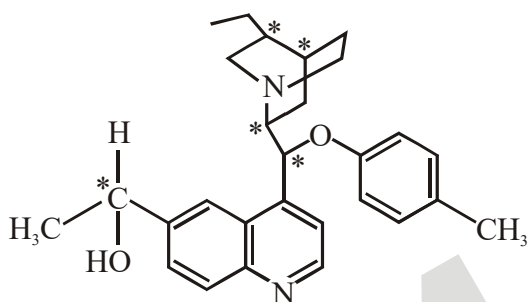
$$\Delta U = 37.89 \times 5 \times 1000 = 189494 \text{ J}$$

22. The number of chiral carbons present in the molecule given below is _____.



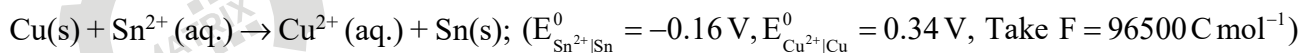
Ans. 5

Sol.



* represent chiral carbon which are 5.

23. The Gibbs energy change (in J) for the given reaction at $[Cu^{2+}] = [Sn^{2+}] = 1\text{ M}$ and 298 K is :



Ans. 96500

Sol. $\Delta G^{\circ} = -nFE_{\text{redox}}^{\circ}$

$$\Delta G^{\circ} = -2 \times 96500 \times (-0.5)$$

$$= 96500\text{ J}$$

Here,

$$E_{\text{redox}}^{\circ} = E_{Sn^{2+}/Sn}^{\circ} - E_{Cu^{2+}/Cu}^{\circ}$$

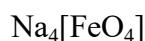
$$= (-0.16) - (0.34)$$

$$= -0.50\text{ V}$$

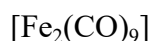
24. The oxidation states of iron atoms in compounds (A), (B) and (C), respectively, are x, y and z. The sum of x, y and z is _____.



(A)

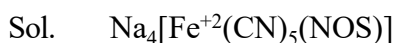


(B)

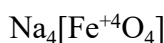


(C)

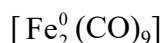
Ans. 6.00



(A)



(B)



(C)

$$2 + 4 + 0 = 6$$

25. The mass of gas adsorbed, x, per unit mass of adsorbate, m, was measured at various pressures, p. A graph between $\log \frac{x}{m}$ and $\log p$ gives a straight line with slope equal to 2 and the intercept equal to 0.4771. The

value of $\frac{x}{m}$ at a pressure of 4 atm is : (Given $\log 3 = 0.4771$)

Ans. 48

Sol. $\left(\frac{x}{m}\right) = k(P)^{\frac{1}{n}}$

$$\log\left(\frac{x}{m}\right) = \log k + \frac{1}{n} \log P$$

$$\text{Slope} = 2$$

$$\text{Slope} = \frac{1}{n} = 2$$

$$\text{So } n = \frac{1}{2}$$

$$\log k = 0.477$$

$$\text{Intercept} \Rightarrow \log k = 0.477 \text{ So } k = \text{Antilog}(0.477) = 3$$

$$\log P$$

$$\text{So } \left(\frac{x}{m}\right) = k(P)^{\frac{1}{n}}$$

$$= 3[4]^2$$

$$= 48$$