

**JEE-ADVANCED-2012-P1-Model**

Time: 3:00 Hrs.

**IMPORTANT INSTRUCTIONS**

Max Marks: 210

**PHYSICS:**

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 10)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 11 – 15)	Questions with Multiple Correct Choice	4	0	5	20
Sec – III(Q.N : 16 – 20)	Questions with Integer Answer Type	4	0	5	20
<b>Total</b>				<b>20</b>	<b>70</b>

**CHEMISTRY:**

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 21 – 30)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 31 – 35)	Questions with Multiple Correct Choice	4	0	5	20
Sec – III(Q.N : 36 – 40)	Questions with Integer Answer Type	4	0	5	20
<b>Total</b>				<b>20</b>	<b>70</b>

**MATHEMATICS:**

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 41 – 50)	Questions with Single Correct Choice	3	-1	10	30
Sec – II(Q.N : 51 – 55)	Questions with Multiple Correct Choice	4	0	5	20
Sec – III(Q.N : 56 – 60)	Questions with Integer Answer Type	4	0	5	20
<b>Total</b>				<b>20</b>	<b>70</b>

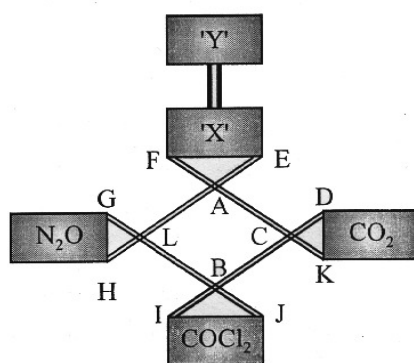
## CHEMISTRY

Max.Marks:70

SECTION – I  
( SINGLE CORRECT CHOICE TYPE )

This section contains 10 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct

21. What is the time required by hypothetical 'Y' gas ( $M/Wt. = 11$ ) for diffusing its 50ml when 100 ml of 'X' gas took 20 sec for diffusion. [Assume  $\text{COCl}_2$  takes 20 sec, to reach B while 'X' gas takes  $\frac{1}{3}$  min. to reach at point A. [Take  $\text{GJ} \parallel \text{FK}$  and  $\text{HE} \parallel \text{ID}$ ,  $\text{GJ} = \text{FK}$  and  $\text{HE} = \text{ID}$ ,  $\text{N}_2\text{O}$  and  $\text{CO}_2$  takes X year to reach L and C point respectively]



A)  $\frac{3}{5}$  sec

B)  $\frac{10}{7}$  sec

C)  $\frac{10}{3}$  sec

D) 20 sec

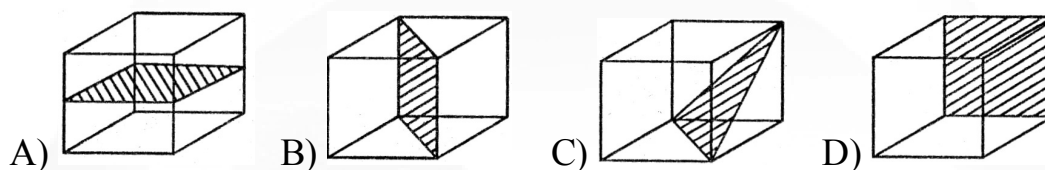
22. The following equations of state are occasionally used for approximate calculation on

gases gas(x):  $pv_m = RT \left( 1 + \frac{G}{V_m} \right)$ ; gas(y):  $P(V_m - G) = RT$  (G is positive value)

Assuming that gas X and Y actually obeyed above equation of state respectively then choose the correct statement

- A) Gas X is more liquefiable than Gas Y
  - B) Gas Y is more liquefiable than Gas X
  - C) Gas X, Y both are liquefiable
  - D) Neither Gas X nor Gas Y is liquefiable
23. When the pressure of a sample of gas is increased from 0.50 to 100 atm at constant temperature, its volume decrease from 2.0L to 13 mL. What could cause the deviation from Boyle's Law?
- A) Volume of the gas molecules is significant fraction of the volume of container at higher pressure
  - B) The force of attraction between the gas molecules is greater when the pressure is higher
  - C) The molecules have dimerised at the higher pressure
  - D) The collision of the molecules on the walls of the container are no longer elastic at higher pressure

24. Which of the following planes pass through maximum number of three dimensional voids in fcc lattice?



25. The diffraction of barium with  $X$ -ray of wavelength  $2.29 \text{ \AA}$  gives a first order diffraction at  $30^\circ$ , the distance between diffracted planes is \_\_\_\_\_

- A)  $2.29 \text{ \AA}$       B)  $0.763 \text{ \AA}$       C)  $4.42 \text{ \AA}$       D)  $1.62 \text{ \AA}$

26. In an FCC unit cell a cube is formed by joining the centres of all the tetrahedral voids to generate a new cube. Then the new cube would contain voids as

- A) 1 full tetrahedral void, 1 full octahedral void  
B) 1 full tetrahedral void only  
C) 1 full tetrahedral void, 2 full octahedral void  
D) 1 full octahedral void only

27. A compound  $A$  dissociate by two parallel first order path at certain temperature



If reaction started with pure ' $A$ ' with 1 mole of  $A$  in 1 litre closed container with initial pressure 2atm. What is the total pressure (in atm) developed in container after 50 minutes from start of experiment?

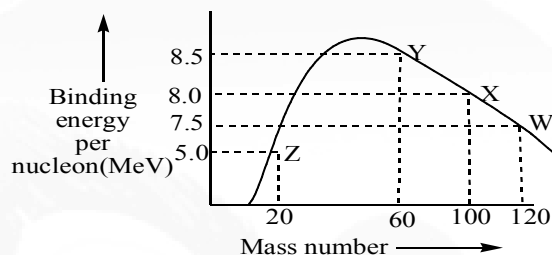
- A) 1.25                      B) 0.75                      C) 1.50                      D) 2.50

28. A certain reactant  $\text{XO}_3^-$  is getting converted to  $\text{X}_2\text{O}_7$  in solution. The rate constant of this reaction is measured by titrating a volume of the solution with a reducing agent which reacts only with  $\text{XO}_3^-$  and  $\text{X}_2\text{O}_7$ . In this process of reduction both the compounds converted to  $\text{X}^-$ . At  $t = 0$ , the volume of the reagent consumed is 30 mL and at  $t = 9.212$  min the volume used up is 36 mL the rate constant of the conversion of  $\text{XO}_3^-$  to  $\text{X}_2\text{O}_7$  assuming reaction is of 1<sup>st</sup> order

(Given that  $\ln 10 = 2.303$ ,  $\log 2 = 0.30$ )

- A)  $0.2 \text{ min}^{-1}$                       B)  $0.02 \text{ min}^{-1}$                       C)  $0.01 \text{ min}^{-1}$                       D)  $0.1 \text{ min}^{-1}$

29. Binding energy per nucleon versus mass number for W, X, Y, Z are indicated on the curve.



The process that would release energy is :

- A)  $Y \rightarrow 3Z$       B)  $W \rightarrow X + Z$       C)  $W \rightarrow 2Y$       D)  $X \rightarrow Y + 2Z$
30. Which of the following options correctly represent sequence of True and False statements
- I) Half life of  $C^{14}H_4$  and  $C^{14}O_2$  will be same
- II) For aluminum stable isotope is  ${}_{13}Al^{27}$ , therefore  ${}_{13}Al^{29}$  is  $\beta$  emitter.
- III) In formation of  ${}_{92}U^{235}$  from appropriate neutrons and protons, energy will be released
- A) TTT      B) TTF      C) FTT      D) FTF

## SECTION – II

( MULTIPLE CORRECT CHOICE TYPE )

This section contains 5 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE** is/ are correct

31. A vessel contains Equimolar mixture of  $H_2$  and  $D_2$  gases, if a pin hole is made in the vessel, then
- A) mole fraction of  $H_2$  in the gas remaining in the vessel will increase with time
  - B) mole fraction of  $D_2$  in the gas remaining in the vessel will increase with time
  - C) the average molecular weight of gas remaining in the vessel will increase with time
  - D) the partial pressure of  $H_2$  in the gas remaining in the vessel will increase with time
32. The HCP and CCP structure for a given element would be expected to have :
- A) The same co-ordination number
  - B) The same density
  - C) The same packing fraction
  - D) Same no. of atoms

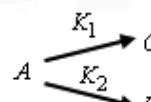
33. Select the correct statement about FCC(ABCAB....) structure.

A) Distance between nearest octahedral void and tetrahedral void is  $\frac{\sqrt{3}a}{4}$

B) Distance between two nearest octahedral void is  $\frac{a}{\sqrt{2}}$

C) Distance between two nearest tetrahedral void is  $\frac{\sqrt{3}a}{4}$

D) Distance between layer A and B is  $2r\sqrt{\frac{2}{3}}$



34. Consider the following case of completing 1<sup>st</sup> order reactions after the start of the reaction  $t = 0$  with only A, the  $[C]$  is equal to  $[D]$  at all times. The time in which all three concentrations will be equal is given by

A)  $t = \frac{1}{2K_1} \ln 3$

B)  $t = \frac{1}{2K_2} \ln 3$

C)  $t = \frac{1}{3K_1} \ln 3$

D)  $t = \frac{1}{3K_2} \ln 3$

35. The unit of radioactivity is –

A) Curie

B) Rutherford

C) Becquerel

D) None of the above



**SECTION –III**  
**( INTEGER ANSWER TYPE)**

This section contains 5 questions . The answer to each of the questions is a single digit integer, ranging from **0** to **9**. The appropriate bubbles below the respective question numbers in the ORS have to be darkened.

36. 0.5 mole of each of  $\text{H}_2$ ,  $\text{SO}_2$ ,  $\text{CH}_4$ ,  $\text{C}_2\text{H}_6$  and  $\text{N}_2$  are kept in a container. A hole was made in the container. After 3 hours the partial pressure of  $\text{CH}_4$  is 0.02 atm. How many gases have partial pressure greater than  $\text{CH}_4$  in the container after 3hrs.
37. The composition of a sample of Wustite is  $\text{Fe}_{0.93}\text{O}$ . The percentage of  $\text{Fe}^{+3}$  present in total iron is approximately =  $5 \times a$ , 'a' is
38. A crystal is made up of atoms X, Y & Z. Atoms, X are in FCC packing. Y occupies all octahedral voids and Z occupies all tetrahedral voids. If all the atoms along two body diagonals are removed, the ratio of sum of effective numbers of atoms of Y and Z to the effective number of atoms of X is  $x : 1$ , what is the value of x?

39. Given two separate reactions



Reaction (I) follows first order kinetics while reaction (II) follows second order kinetics. Both the reactions have same half lives. When the initial concentration of (A) is 'n' times that of (B), then the rate of reaction (I) is 1.386 times that of reaction (II) at the start of reaction. The value of 'n' is \_\_\_\_\_

40. The count rate of 200 mL of a radioactive liquid sample is x. Some of the liquid is now discarded. The count rate of the remaining liquid after four half-lives is found to be  $x/20$ . The volume in milliliters of the remaining liquid is 40y,

y = \_\_\_\_\_