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CANDIDATE ANSWER BOOKLET JEE

CANDIDATE DETAILS

NAME OF STUDENT ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

DATE OF EXAMINATION ☐☐ / ☐☐ / ☐☐☐☐

CLASS ☐☐

BOARD ☐☐☐☐

TIME DURATION ☐☐ : ☐☐ To ☐☐ : ☐☐

Read The Instructions Carefully

- Please read these instructions carefully. A candidate who breaches any of the Examination Regulations will be liable to disciplinary action
- Examinations will be conducted during the allocated times shown in the examination timetable.
- Do NOT turn over the question paper until instructed at the time of commencement of the examination.
- Any unauthorised materials or devices found in your possession after the start of the examination will be confiscated, and you will be liable to disciplinary action.
- Handphones brought into the examination hall must be switched off at ALL times. If your handphone is found to be switched on in the examination hall, the handphone will be confiscated and retained for investigation of possible violation of regulations.
- Please check that you have the correct question paper and read the instructions printed on your examination question paper carefully.
- You are not allowed to communicate by word of mouth or otherwise with other candidates (this includes the time when answer scripts are being collected).
- Please raise your hand if you wish to communicate with an invigilator.
- Unless granted permission by an invigilator, you are not allowed to leave your seat.
- Once you have entered the examination hall, you will not be allowed to leave the hall until one hour after the examination has commenced.

Question Paper Format

- Each question carries 4 marks.
- For correct answer, +4 marks. For wrong answer, -1 marks. For no attempt, 0 marks.
- All questions are compulsory.
- The question paper contains 25 objective type questions.
- Total time duration of the examination is 60 minutes.

Score Card

+4	
0	
-1	

Total Score

Pass Score

Result

Pass/Fail

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1. The coordination number of a metal crystallising in a hcp structure is
(A) 12 (B) 4 (C) 8 (D) 6

2. Which of the following FCC structure contains cations in alternate tetrahedral voids?
(A) NaCl (B) ZnS (C) Na_2O (D) CaF_2

3. The van't Hoff factor for 0.1 M $Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is
(A) 91.3% (B) 87% (C) 100% (D) 74%

4. In a first order reaction the concentration of reactant decreases from 800 mol/dm^3 to 50 mol/dm^3 in 2×10^4 sec. The rate constant of reaction in sec^{-1} is
(A) 2×10^4 (B) 3.45×10^{-5} (C) 1.3486×10^{-4} (D) 2×10^{-4}

5. In the depression of freezing point experiment, it is found that
(I) The vapour pressure of the solution is less than that of pure solvent.
(II) The vapour pressure of the solution is more than that of pure solvent.
(III) Only solute molecules solidify at the freezing point.
(IV) Only solvent molecules solidify at the freezing point.
(A) I, II (B) II, III (C) I, IV (D) I, II, III

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6. NH_4Cl crystallizes in a body-centered cubic type lattice with a unit cell edge length of 387 pm. The distance between the oppositively charged ions in the lattice is
(A) 335.1 pm (B) 83.77 pm (C) 274.46 pm (D) 137.23 pm

7. During depression of freezing point in a solution, the following are in equilibrium
(A) liquid solvent-solid solvent (B) liquid solvent-solid solute
(C) liquid solute-solid solute (D) liquid solute-solid solvent

8. The reaction, X $\longrightarrow$ Product follows first order kinetics. In 40 minutes the concentration of X changes from 0.1 M to 0.025 M. Then the rate of reaction when concentration of X is 0.01 M
(A) 1.73×10^{-4} M min $^{-1}$ (B) 3.47×10^{-5} M min $^{-1}$
(C) 3.47×10^{-4} M min^{-1} (D) 1.73×10^{-5} M min^{-1}

9. The maximum efficiency of a heat engine operating between 100°C and 25°C is
(A) 20% (B) 22.2% (C) 25% (D) none

10. A compound XY crystallizes in BCC lattice with unit cell edge lenght of 480 pm. If the radius of Y^- is 225 pm, then the radius of X^+ is
(A) 127.5 pm (B) 190.68 pm (C) 225 pm (D) 255 pm

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11. The density of CaF_2 (fluorite structure) is 3.18 g/cm^3. The length of the side of the unit cell is
(A) 253 pm (B) 344 pm (C) 546 pm (D) 273 pm

12. Mole fraction of A vapours above the solution in mixture of A and B ($X_A = 0.4$) will be
[Given : $P_A^\circ = 100$ mm Hg and $P_B^\circ = 200$ mm Hg]
(A) 0.4 (B) 0.8 (C) 0.25 (D) none of these

13. The rate law for the reaction
$RCl + NaOH\ (aq) \longrightarrow ROH + NaCl$ is given by Rate = k[RCl]. The rate of the reaction will be
(A) Doubled on doubling the concentration of sodium hydroxide
(B) Halved on reducing the concentration of alkyl halide to one half
(C) Decreased on increasing the temperature of reaction
(D) Unaffected by increasing the temperature of the reaction.

14. A solid has a structure in which W atoms are located at the corners of a cubic lattice, $\bar{O}$ atom at the centre of the edges and Na atom at centre of the cubic. The formula for the compound is
(A) $NaWO_2$ (B) $NaWO_3$ (C) Na_2WO_3 (D) $NaWO_4$

15. The rate of a reaction is expressed in different ways as follows :

$$+\frac{1}{2}\frac{d[C]}{dt} = -\frac{1}{3}\frac{d[D]}{dt} = +\frac{1}{4}\frac{d[A]}{dt} = -\frac{d[B]}{dt}$$

The reaction is:
(A) $4A + B \longrightarrow 2C + 3D$ (B) $B + 3D \longrightarrow 4A + 2C$
(C) $A + B \longrightarrow C + D$ (D) $B + D \longrightarrow A + C$

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16. A first order reaction is 50% completed in 20 minutes at 27°C and in 5 min at 47°C. The energy of activation of the reaction is
(A) 43.85 kJ/mol (B) 55.14 kJ/mol (C) 11.97 kJ/mol (D) 6.65 kJ/mol

17. The solubility of AgCl in water, 0.01 M $CaCl_2$, 0.02 M NaCl and 0.05 M $AgNO_3$ are denoted by S_1, S_2, S_3 and S_4 respectively. Which of the following relationship is correct?
(A) $S_1 > S_2 > S_3 > S_4$ (B) $S_1 = S_2 = S_3 = S_4$
(C) $S_1 > S_3 > S_2 > S_1$ (D) $S_1 > S_2 = S_3 > S_4$

18. A solid is formed and it has three types of atoms X, Y, Z. X forms a FCC lattice with Y atoms occupying all the tetrahedral voids and Z atoms occupying half the octrahedral voids. The formula of the solid is:
(A) X_2Y_4Z (B) XY_2Z_4 (C) X_4Y_2Z (D) X_4YZ_2

19. For an ideal binary liquid solution with $P_A^\circ > P_B^\circ$, which relation between X_A (mole fraction of A in liquid phase) and Y_A (mole fraction of A in vapour phase) is correct?
(A) $Y_A < Y_B$ (B) $X_A > X_B$ (C) $\frac{Y_A}{Y_B} > \frac{X_A}{X_B}$ (D) $\frac{Y_A}{Y_B} < \frac{X_A}{X_B}$

20. The coordination number of cation and anion in Fluorite CaF_2 and CsCl are respectively
(A) 8:4 and 6:3 (B) 6:3 and 4:4 (C) 8:4 and 8:8 (D) 4:2 and 2:4

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INTEGER TYPE QUESTIONS:

1. Two substances A ($t_{1/2}$= 5 mins) and B ($t_{1/2}$ = 15 mins) follow first order kinetics are taken in such a way that initially [A]= 4[B]. Calculate the time after which the concentration of both the substance will be equal.

Answer: ☐

2. Water expands when it freezes. Determine amount of work in joules, done when a system consisting of 1.0 L of liquid water freezes under a constant pressure of 1.0 atm and forms 1.1 L of ice.

Answer: ☐

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36. At a given temperature, total vapour pressure in Torr of a mixture of volatile components A and B is given by

$$P_{Total} = 120 - 75\ X_B$$

hence, vapour pressure of pure A and B respectively (in Torr) are

(A) 120, 75 (B) 120, 195 (C) 120, 45 (D) 75, 45

37. How many moles NH_3 must be added to 2.0 litre of 0.80 M $AgNO_3$ in order to reduce the Ag^+ concentration to 5×10^{-8} M. K_f of $[Ag(NH_3)_2^+] = 10^8$

(A) 0.4 (B) 2 (C) 3.52 (D) 4

38. $r_{Na^+} = 95$ pm and $r_{Cl^-} = 181$ pm in NaCl (rock salt) structure. What is the shortest distance between Na^+ ions?

(A) 778.3 pm (B) 276 pm (C) 195.7 pm (D) 390.3 pm

39. In which of the following the central atom does not use sp^3 hybrid orbitals in its bonding?

(A) BeF_3^- (B) OH_3^+ (C) NH_2^- (D) NF_3

40. Ethanol can undergoes decomposition to form two sets of products

$$C_2H_5OH\ (g) \xrightarrow{1} C_2H_4(g) + H_2O\ (g) \qquad \Delta H^\circ = 45.54\ kJ$$

$$C_2H_5OH\ (g) \xrightarrow{2} CH_3CHO(g) + H_2\ (g) \qquad \Delta H^\circ = 68.91\ kJ$$

if the molar ratio of C_2H_4 to CH_3CHO is 8 : 1 in a set of product gases, then the energy involved in the decomposition of 1 mole of ethanol is

(A) 65.98 kJ (B) 48.137 kJ (C) 48.46 kJ (D) 57.22 kJ

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21. Elevation of boiling point of 1 molar aqueous glucose solution (density = 1.2 g/ml) is

(A) K_b (B) 1.20 K_b (C) 1.02 K_b (D) 0.98 K_b

22. One mole of $N_2O_4(g)$ at 300 K is left in a closed container under one atm. It is heated to 600 K when 20 % by mass of $N_2O_4(g)$ decomposes to $NO_2(g)$. The resultant pressure is :

(A) 1.2 atm (B) 2.4 atm (C) 2.0 atm (D) 1.0 atm

23. The conjugate acid of NH_2^- is

(A) NH_3 (B) NH_2OH (C) NH_4^+ (D) N_2H_4

24. 1.0 molal aqueous solution of an electrolyte A_2B_3 is 60% ionised. The boiling point of the solution at 1 atm is ($K_{b(H_2O)} = 0.52\ K\ kg\ mol^{-1}$)

(A) 274.76 K (B) 377 K (C) 376.4 K (D) 374.76 K

25. The equilibrium $SO_2Cl_2(g) \rightleftharpoons SO_2(g) + Cl_2(g)$ is attained at 25°C in a closed rigid container and an inert gas, helium is introduced. Which of the following statements is/are correct.

(A) concentrations of SO_2, Cl_2 and SO_2Cl_2 do not change

(B) more chlorine is formed

(C) concentration of SO_2 is reduced

(D) more SO_2Cl_2 is formed

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26. The vapour pressure of a solvent decreased by 10 mm of Hg when a non-volatile solute was added to the solvent. The mole fraction of solute in solution is 0.2, what would be mole fraction of the solvent if decrease in vapour pressure is 20 mm of Hg

(A) 0.2 (B) 0.4 (C) 0.6 (D) 0.8

27. Reaction $A + B \longrightarrow C + D$ follow's following rate law : rate = $k = [A]^{+\frac{1}{2}}[B]^{\frac{1}{2}}$. Starting with initial conc. of one mole of A and B each, what is the time taken for amount of A of become 0.25 mole. Given $k = 2.31 \times 10^{-3}$ sec^{-1}.

(A) 300 sec. (B) 600 sec. (C) 900 sec. (D) none of these

28. For the reaction : $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$, the degree of dissociated (α) of HI(g) is related to equilibrium constant K_P by the expression

(A) $\frac{1+2\sqrt{K_p}}{2}$ (B) $\sqrt{\frac{1+2K_p}{2}}$ (C) $\sqrt{\frac{2K_p}{1+2K_p}}$ (D) $\frac{2\sqrt{K_p}}{1+2\sqrt{K_p}}$

29. A gas undergoes dissociation as $A_4(g) \longrightarrow 4A(g)$ in a closed rigid container having volume 22.4 litres at 273 K. If the initial moles of A_4 taken before dissociation is 1 then
The total pressure (in atm) after 50% completion of the reaction (assuming ideal behaviour)

(A) 1/2 (B) 2.5 (C) 2 (D) 4

30. The energy of an electron in the first Bohr orbit of H atom is – 13.6 eV . The possible energy value(s) of the excited state(s) for electrons in Bohr orbits of hydrogen is/are :

(A) – 3.4 eV (B) – 4.2 eV (C) – 6.8 eV (D) + 6.8 eV

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31. The rate constant for the forward reaction $A(g) \rightleftharpoons 2B(g)$ is 1.5×10^{-3} s^{-1} at 100 K. If 10^{-5} moles of A and 100 moles of B are present in a 10 litre vessel at equilibrium then rate constant for the backward reaction at this temperature is

(A) 1.50×10^{4} L mol^{-1} s^{-1} (B) 1.5×10^{11} L mol^{-1} s^{-1}
(C) 1.5×10^{10} L mol^{-1} s^{-1} (D) 1.5×10^{-11}

32. The radius of which of the following orbit is same as that of the first Bohr's orbit of hydrogen atom?

(A) He^+ (n = 2) (B) Li^{2+} (n = 2) (C) Li^{2+} (n = 3) (D) Be^{3+} (n = 2)

33. The ratio of difference in wavelengths of 1st and 2nd lines of Lyman series in H–like atom to difference in wavelength for 2nd and 3rd lines of same series is:

(A) 2.5 : 1 (B) 3.5 : 1 (C) 4.5 : 1 (D) 5.5 : 1

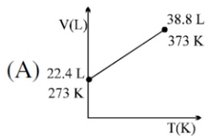
34. Consider the following first order competing reactions:

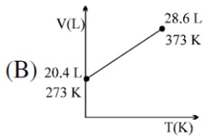
$X \xrightarrow{k_1} A + B$ and $Y \xrightarrow{k_2} C + D$

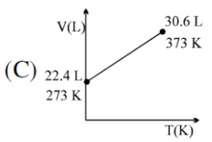
if 50% of the reaction of X was completed when 96% of the reaction of Y was completed, the ratio of their rate constants (k_2/k_1) is

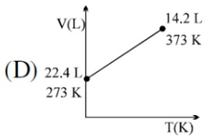
(A) 4.06 (B) 0.215 (C) 1.1 (D) 4.65

35. Which one of the following V, T plots represents the behaviour of one mole of an ideal gas at one atmp?

(A) 

(B) 

(C) 

(D) 

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