MCQ

1. Calculate ΔG° for the following cell reaction.

$$Zn_{(s)} + Ag_2O_{(s)} + H_2O((I)) \rightarrow Zn^{2+}_{aq} + 2Ag(s) + 2OH^-_{(aq)}$$

$$E^\circ_{\frac{Ag^+}{Ag}} = +0.80V \text{ and } E^\circ_{\frac{Zn^{2+}}{Zn}} = -0.76V$$

A. $-3.5kJ/mol$

B. $-301kJ/mol$

C. $305kJ/mol$

D. $301kJ/mol$

Answer: B

2. The time required for a first order reaction to complete 90% is T. What is the time required to complete 99% of the same reaction?
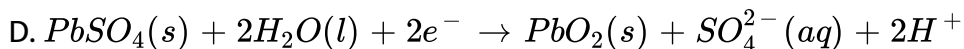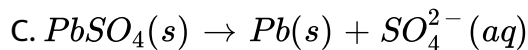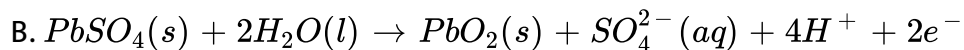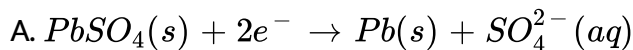
A. 2t

B. 3t

C. t

D. 4t

Answer: A

3. A lead storage battery is discharged. During the charging of this battery, the reaction that occurs at anode is

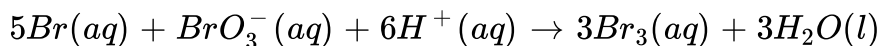A. $PbSO_4(s) + 2e^- \rightarrow Pb(s) + SO_4^{2-}(aq)$

B. $PbSO_4(s) + 2H_2O(l) \rightarrow PbO_2(s) + SO_4^{2-}(aq) + 4H^+ + 2e^-$

C. $PbSO_4(s) \rightarrow Pb(s) + SO_4^{2-}(aq)$

D. $PbSO_4(s) + 2H_2O(l) + 2e^- \rightarrow PbO_2(s) + SO_4^{2-}(aq) + 2H^+$

Answer: A

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4. For the reaction

$$5Br(aq) + BrO_3^-(aq) + 6H^+(aq) \rightarrow 3Br_3(aq) + 3H_2O(l)$$

If, $-\dfrac{\Delta[Br]}{\Delta t} = 0.05 molL^{-1}min^{-1}$, $-\dfrac{\Delta[BrO_3]}{\Delta t} \in molL^{-1}min^{-1}is$

A. 0.005

B. 0.05

C. 0.5

D. 0.01

Answer: D

5. At 298 K molar conductivities at infinite dilution ($\wedge_m^\circ$) of NH_4Cl, KOH and KCl are 152.8, 272.6 and 149.8 S $cm^2 mol^{-1}$ respectively. The $\wedge_m^\circ$ of NH_4OH in $Scm^2 mol^{-1}$ and % dissociation of 0.01 M NH_4OH with $\wedge_m = 25.1 Scm^2 mol^{-1}$ at the same temperature are,

A. 275.6,0.91

B. 275.6,9.1

C. 266.6,9.6

D. 30,84

Answer: B

6. In a first order reaction, the concentration of the reactant decrease from 0.6 M to 0.3 M in 15 min. The time taken for the concentration to change from 0.1 M to 0.025 M in minutes is
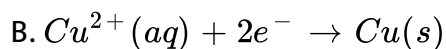
A. 1.2

B. 12
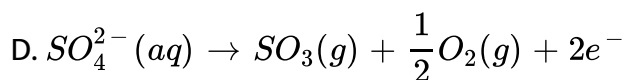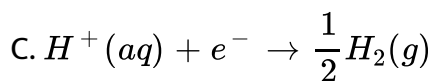
C. 30

D. 3

Answer: C

7. During the electrolysis of copper sulphate aqueous solution using copper electrode, the reaction taking place at the cathode is

A. $Cu \rightarrow Cu^{2+}(aq) + 2e^-$

B. $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

C. $H^+(aq) + e^- \rightarrow \frac{1}{2}H_2(g)$

D. $SO_4^{2-}(aq) \rightarrow SO_3(g) + \frac{1}{2}O_2(g) + 2e^-$

Answer: B

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8. The extent of charge of lead accumulator is determined by

    A. amount of $PbSO_4$ in the battery

    B. amount of PbO_2 in the battery

    C. specific gravity of H_2SO_4 of the battery

    D. amount of Pb in the battery

Answer: C

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9. Which of the following relation is correct for a first order reaction?

(k=rate constant, r=rate of reaction , c=conc. Of reactat

A.

B.

C.

D.

Answer: C

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10. The emf (in V) of a Daniell cell containing 0.1 M $ZnSO_4$ and 0.01 M $CuSO_4$ solutions at their respective electrodes is

$$\left(E^{\circ}_{\frac{Cu^{2+}}{Cu}} = +0.34V, E^{\circ}_{\frac{Zn^{2+}}{Zn}} = -0.76V \right)$$
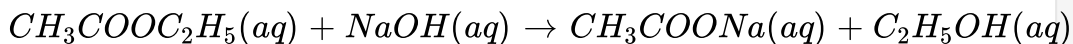
A. 1.1

B. 1.16

C. 1.13

D. 1.07

Answer: D

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11. Which one of the following statements is correct for the reaction?

$$CH_3COOC_2H_5(aq) + NaOH(aq) \rightarrow CH_3COONa(aq) + C_2H_5OH(aq)$$

A. Order is two but molecularity is one

B. Order is one but molecularity is two

C. Order is one but molecularity is one

D. Order is two but molecularity is two

Answer: D

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12. Match the following lists.

A. a(III) b(I) c(II) d(V)

B. a(II) b(V) c(I) d(IV)

C. a(III) b(IV) c(I) d(II)

D. a(V) b(I) c(IV) d(II)

Answer: C

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13. If the values of $\wedge_\infty$ of NH_4Cl, $NaOH$ and NaCl are 130, 217 and 109 $ohm^{-1}cm^2 \equiv^{-1}$ respectively, the $\wedge_\infty$ of $NH_4OH \in ohm^{-1}cm^2 \equiv^{-1}$ is

A. 238

B. 196

C. 22

D. 456

Answer: A

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14. A solution of concentration C g equiv/L, has a specific resistance R. The equivalent conductance of the solution is

A. $\dfrac{R}{C}$

B. $\dfrac{C}{R}$

C. $\dfrac{1000}{RC}$

D. $\dfrac{1000R}{C}$

Answer: C

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15. What is the slope of the straight line for the graph drawn between lnk and y, where k is the rate constant of a reaction at temperature T?

A. $-\dfrac{E_a}{2.303R}$

B. $\dfrac{-E_a}{R}$

C. $\dfrac{E_a}{R}$

D. $\dfrac{R}{E_a}$

Answer: B

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16. At a certain temperature and at infinite dilution, the equivalent conductances of sodium benzoate, hydrochloric acid and sodium chloride are 240, 349 and 229 $ohm^{-1}cm^2 \equiv^{-1}$ respectively. The

equivalent conductance of benzoic acid in $ohm^{-1}cm^2 \equiv^{-1}$ at the same conditions is

A. 80

B. 328

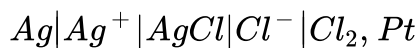C. 360

D. 408

Answer: C

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17. For the following cell reaction,

$$Ag|Ag^+|AgCl|Cl^-|Cl_2, Pt$$

$$\Delta G_f^0(AgCl) = -109kJ/mol$$

$$\Delta G_f^0(Cl) = -129kJ/mol$$

$$\Delta G_f^0(Ag^+) = 78kJ/mol$$

E° of the cell is

A. -0.60 V

B. 0.60 V

C. 6.0 V

D. None of these

Answer: A

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18. At 25ºC the molar conductances at infinite dilution for the strong electrolytes NaOH, NaCl and $BaCl_2$ are 248×10^{-4}, 126×10^{-4} and $280 \times 10^{-4} Sm^2 mol^{-1}$ respectively, $\lambda_m^o Ba(OH)_2$ in $Sm^2 mol^{-1}$ is

A. 52.4×10^{-4}

B. 524×10^{-4}

C. 402×10^{-4}

D. 262×10^{-4}

Answer: B

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19. For a first order reaction at $27°C$, the ratio of time required for 75% completion to 25% completion of reaction is

A. 3

B. 2.303

C. 4.8

D. 0.477

Answer: C

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20. When same quantity of electricity is passed through aqueous $AgNO_3$ and H_2SO_4 solutions connected in series, 5.04×10^{-2}g of H_2

is liberated. What is the mass of silver (in grams) deposited? (Eq. wts. of hydrogen =1.008, silver =108)

A. 54

B. 0.54

C. 5.4

D. 10.8

Answer: C

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21. When electric current is passed through acidified water for 1930s, 1120 mL of H_2 gas is collected (at STP) at the cathode. What is the current passed in ampere?

A. 0.05

B. 0.5

C. 5
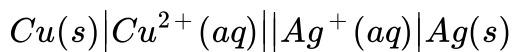
D. 50

Answer: C

22. Calculate the emf of the cell

$$Cu(s)\big|Cu^{2+}(aq)\big|\big|Ag^{+}(aq)\big|Ag(s)$$

Given,

$$E_{(Cu^{2+})/(Cu)} = +0.34V, E_{(Ag^{+})/(Ag)} = 0.80V$$

A. + 0.46V

B. +1.14V

C. + 0.57V

D. -0.46V

Answer: A

23. The standard reduction potentials of $Zn^{2+}/Zn, Cu^{2+}/Cu$ and Ag^+/Ag are respectively -0.78, 0.34 and 0.8 V. The following cells were constructed:

(1) $Zn|Zn^{2+}||Cu^{2+}|Cu$

(2) $Zn|Zn^{2+}||Ag^+|Ag$

(3) $Cu|Cu^{2+}||Ag^+|Ag$
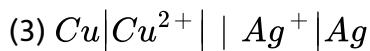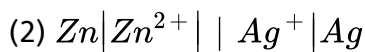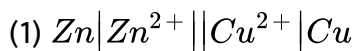
What is the correct order of of these cells?

A. $2 > 3 > 1$

B. $2 > 1 > 3$

C. $1 > 2 > 3$

D. $3 > 1 > 2$

Answer: B

24. What is the time (in sec) required for depositing all the silver present in 125 mL of 1M $AgNO_3$ solution by passing a current of 241.25 A?

A. 10

B. 50

C. 1000

D. 100

Answer: B

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25. Assertion (A) : A current of 96.5 A is passed into aqueous $AgNO_3$ solution for 100s. The weight of silver deposited is 10.8g (at. wt. of Ag =108).

Reason (R) : The mass of a substance deposited during the electrolysis

of an electrolyte is inversely proportional to the quantity of electricity passing through the electrolyte.

The correct answer is

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: C

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26. Which of the following is not correct?

A. Aqueous solution of NaCl is an electrolyte

B. The units of electrochemical equivalent are g-C

C. In the Nernst equation, n represents the number of electrons transferred in the electrode reaction

D. Standard reduction potential of hydrogen electrode is zero volt

Answer: B

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27. The electrochemical equivalent of a metal is 'x' $g - C^{-1}$,The equivalent weight of metal is

A. x

B. $x \times 96500$

C. $\dfrac{x}{96500}$

D. $1.6 \times 10^{-19}x$

Answer: B

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28. When X amperes of current is passed through molten for 96.5s, 0.09 g of aluminium is deposited. What is the value of X?

    A. 10A

    B. 20A

    C. 30A

    D. 40A

Answer: A

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29. What is the reduction electrode potential (in volts) of copper electrode, when $[Cu^{2+}]$ = 0.01 M is in a solution at $25°$ C? ($E°$ of Cu^{2+}/Cu electrode is + 0.34 V.)

    A. 0.3991

B. 0.2809

C. 0.3105

D. 0.3695

Answer: B

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30. 0.066 g of metal was deposited, when a current of 2 A is passed through a metal ion solution for 100s. What is the electrochemical equivalent (in $g - C^{-1}$) of the metal?
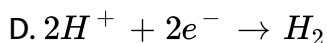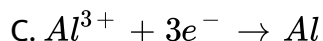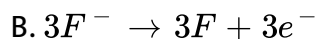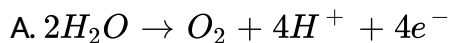
A. 3.3×10^{-6}

B. 3.3×10^{-4}

C. 0.033

D. 3.3

Answer: B

31. During the electrolytic reduction of alumina, the reaction at cathode is

A. $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$

B. $3F^- \rightarrow 3F + 3e^-$

C. $Al^{3+} + 3e^- \rightarrow Al$

D. $2H^+ + 2e^- \rightarrow H_2$

Answer: C

32. One ampere of current is passed for 9650s through molten $AlCl_3$. What is the weight, in gram, of Al deposited at cathode?(atomic weight of Al =27)
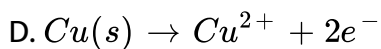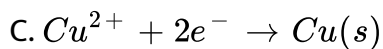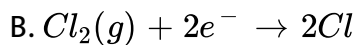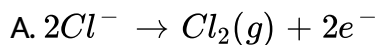
A. 0.9

B. 9

C. 0.09

D. 90

Answer: A

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33. Molten $CuCl_2$ is electrolysed using platinum electrodes. The reaction occuring at anode is

A. $2Cl^- \rightarrow Cl_2(g) + 2e^-$

B. $Cl_2(g) + 2e^- \rightarrow 2Cl$

C. $Cu^{2+} + 2e^- \rightarrow Cu(s)$

D. $Cu(s) \rightarrow Cu^{2+} + 2e^-$

Answer: A

34. What is the approximate quantity of electricity (in coulomb) required to deposit all the silver from 250 mL of 1 M $AgNO_3$ aqueous solution?

A. 96500

B. 24125

C. 48250

D. 12062.5

Answer: B

35. The units of electrochemical equilvalent are

A. gC

B. $gamp^{-1}s^{-1}$

C. $gamps^{-1}$

D. $amp^{-1}s$

Answer: B

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36. The cell reaction of a cell is

$$Mg(s) + Cu^{2+}(aq) \rightarrow Cu(s) + Mg^{2+}(aq)$$
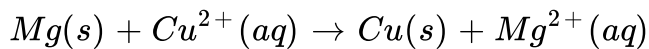
If the standard reduction potentials of magensium and copper are -0.33

and +2.38 V respectively, the emf of the cell is

A. + 2.03V

B. -2.03V

C. + 2.71V

D. -2.71V

Answer: C

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37. Which one of the following metals will not reduce H_2O?
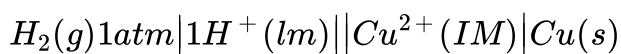
   A. Ca

   B. Fe

   C. Cu

   D. Li

Answer: C

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38. In the electrochemical cell

$$H_2(g)1atm|1H^+(lm)||Cu^{2+}(IM)|Cu(s)$$

Which one of the following statements is true?

A. H_2 is cathode, Cu is anode

B. Oxidation occurs at Cu electrode

C. Reduction occurs at H_2 electrode

D. H_2 is anode, Cu is cathode

Answer: D

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39. On passing a current through a KCl solution, 19.5g of potassium is deposited. If the same quantity of electricity is passed through a solution of aluminium chloride, the amount of aluminium deposited is
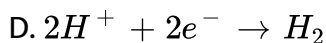
A. 4.5g

B. 9.0g

C. 13.5g

D. 27g

Answer: A

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40. The reaction taking place at the anode, when an aqueous solution of $CuSO_4$ is electrolysed using inert Pt electrode, is

A. $2SO_4^{2-} \rightarrow S_2O_4^{2-} + 2e^-$

B. $Cu^{2+} + 2e^- \rightarrow Cu$

C. $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$

D. $2H^+ + 2e^- \rightarrow H_2$

Answer: C

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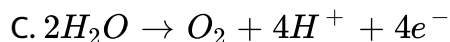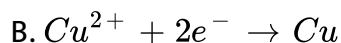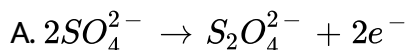
41. The standard reduction potentials at 298 K for the following half cell reactions are given below

$$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s) - 0.762$$

$$Cr^{3+}(aq) + 3e^- \rightarrow Cr(s) - 0.740$$

$$2H^+(aq) + 2e^- \rightarrow H_2(g) - 0.000$$

$$Fe^{3+}(aq) + e^- \rightarrow Fe^{3+}(aq) - 0.770$$
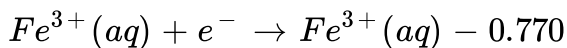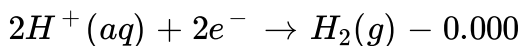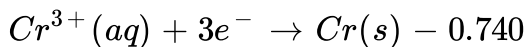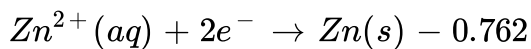
Which one is the strongest reducing agent?

    A. Zn (s)

    B. Cr(s)

    C. H_2(g)

    D. Fe^{2+}(aq)

Answer: A

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42. When Zn metal is added to $CuSO_4$ solution, Cu is precipitated, it is due to

    A. Oxidation of Cu^{2+}

B. Reduction of Cu^{2+}

C. Hydrolysis of $CuSO_4$

D. Ionisation of $CuSO_4$

Answer: B

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43. Which of the following alkali metals has the greatest tendency for the half reaction.

$M(g) \rightarrow M^+(g) + e^-?$
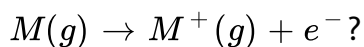
A. Sodium

B. Lithium

C. Potassium

D. Cesium

Answer: B

44. When a copper wire is dipped in aqueous $AgNO_3$ solution, the solution turns blue. The reason for this is

A. Oxidation of silver

B. Reduction of copper

C. Oxidation of copper

D. Reduction of silver

Answer: C

45. How many grams of copper would be deposited, if 3.00 A of current is passed through a solution of $CuSO_4$ for 4h? (At. wt. of Cu = 63.54)

A. 7.11

B. 14.22

C. 2844

D. 56.88

Answer: B

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46. The metal that has the highest electrical conductivity is

A. Al

B. Cu

C. Ag

D. Au

Answer: C

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47. How many grams of copper will be deposited from a solution of $CuSO_4$ by passing 0.5 F of electricity?

A. 31.75

B. 63.5

C. 15.875

D. 127

Answer: C

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48. The single electrode reactions,

$Cd(s) \rightarrow Cd^{2+}(0.1) + 2e^-, E^\circ = 0.4030$

$Cu^{2+} + 2e^- \rightarrow Cu(s), E^\circ = 0.337$
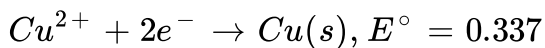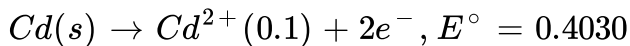
can be combined to give the cell reaction, $Cd(s) + Cu^{2+} \rightarrow Cu(s)$

The emf of the cell is

A. 0.74

B. 0.1354

C. 0.66

D. 0.066

Answer: A

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49. When dilute H_2SO_4 is electrolysed at room temperature between platinum electrodes, the substance liberated at the anode is

A. S

B. SO_2

C. H_2

D. O_2

Answer: D

50. When 9.65 C of electricity is passed through a solution of $AgNO_3$ (atomic weight of silver 108), the amount of silver deposited is

A. 10.8mg

B. 5.4mg

C. 16.2mg

D. 21.2mg

Answer: A

51. Three faradays of electricity was passed through an aqueous solution of iron (II) bromide. The weight of iron metal (at.wt. = 56) deposited at the cathode is (in grams)

A. 56

B. 56

C. 56

D. 168

Answer: B

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52. For a reversible reaction $A \leftrightarrow B$, which one of the following statements is wrong from the given energy Reaction coordinate

A. Activation energy of forward reaction is greater than backward reaction

B. The forward reaction is endothermic

C. The threshold energy is less than that of activation energy

D. The energy of activation of forward reaction is equal to the sum of heat of reaction and the energy of activation of backward reaction.

Answer: C

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53. The rate constant of a first order reaction at $27°C$ is $10^{-3} min^{-1}$. The temperature coefficient of this reaction is 2. What is the rate constant (in min^{-1}) at $17°C$ for this reaction?

A. 10^{-3}

B. 5×10^{-4}

C. 2×10^{-3}

D. 2×10^{-3}

Answer: B

54. Observe the following reaction:

$$2A + B \rightarrow C$$

The rate of formation of C is 2.2×10^3 mol L^{-1} $\overset{-1}{min}$ .What is the value

$$-\frac{d(A)}{dt} (\text{in } molL^{-1}min^{-1})$$

A. $2.2 \times I0^{-3}$

B. 1.1×10^{-3}

C. $4.4x10^{-3}$

D. 5.5×10^{-3}

Answer: C

55. ___of a reaction cannot be determined experimentally.

A. Order

B. Order

C. Rate constant

D. Molecularity

Answer: D

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56. Which one of the following equations is correct for the reaction

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$?
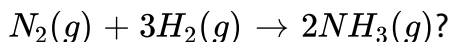
A. $3\dfrac{d[NH_3]}{dt} = 2\dfrac{d[H_2]}{dt}$

B. $2\dfrac{d[NH_3]}{dt} = 3\dfrac{d[H_2]}{dt}$

C. $3\dfrac{d[NH_3]}{dt} = -2\dfrac{d[H_2]}{dt}$

D. $3\dfrac{d[NH_3]}{dt} = -2\dfrac{d[H_2]}{dt}$

Answer: D

57. Consider the following reaction:
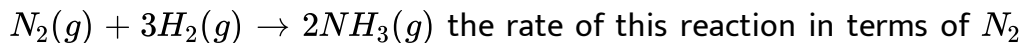
$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ the rate of this reaction in terms of N_2 at T K is $= \dfrac{-d[N_2]}{dt} = 0.02molL^{-1}s^{-1}$. What is the value of $\dfrac{-d[N_2]}{dt}$ (in units of $molL^{-1}s^{-1}$) at the same temeprature.

A. 0.02

B. 50

C. 0.06

D. 0.04

Answer: D

58. One mole of A (g) is heated to $200°$ C in a one litre closed flask, till the following equilibrium is reached.

$A(g) \leftrightarrow B(g)$

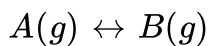The rate of forward reaction, at equilibrium, is 0.02 $molL^{-1}min^{-1}$. What is the rate (in $molL^{-1}min^{-1}$) of the backward reaction at equilibrium?

A. 0.04

B. 0.01

C. 0.02

D. 1

Answer: C

59. Equilibrium constant for the reaction, $H_2O(g) + CO(g)$ is 81. If the velocity constant of the forward reaction is 162 L mol s^{-1}, what is the velocity constant (in $mols^{-1}$) for the backward reaction?

A. 13122

B. 2

C. 261

D. 243

Answer: B

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60. Consider the following reaction:

$A \rightarrow$ Products

This reaction is completed in 100 min.

The rate constant of this reaction at $t_1 = 10$ min , is $10^{-2} min^{-1}$.

What is the rate constant (in min^{-1}) at $t_2 = 20$ min ?

A. 2×10^{-2}

B. 10^{-2}

C. 5×10^{-3}

D. 0.1

Answer: B

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61. The half-life of a first order reaction is 10s. What is its rate constant (in s^{-1}) ?

A. 0.0693

B. 0.693

C. 6.93

D. 69.3

Answer: A

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62. 75% of a first order reaction is completed in 32 min. 50% of the reaction would have been completed in

A. 24min

B. 16min

C. 18min

D. 24min

Answer: B

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63. The ΔH value for the reaction,

$H_2 + Cl_2 \rightarrow 2HCl$ is - 44.12 Kcal

If E_1 is the activation energy of the reactants and E, is the activation

energy of the products, for the above reaction.

A. $E_1 > E_2$

B. $E_1 < E_2$

C. $E_1 = E_2$

D. ΔH is not related to E_1 or E_2

Answer: B

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64. In the equilibrium reaction,

$A + B \leftrightarrow C + D$

The activation energy for the forward reaction is 25 kcal mol^{-1} and

that of the backward reaction is 15 kcal mol^{-1}. Which one of the following statements is correct?

A. It is an exothermic proces

B. It is an endothemic process

C. It is a reaction for which $\Delta H = 0$

D. It is a reaction for which $\Delta H = 0$

Answer: B

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65. With respect to the figure given, which of the following statements is correct?

A. ΔE for forward reaction is C - B

B. ΔE for the forward reaction is B - A

C. $E_{\text{forward}} > E_{\text{backward}}$

D. ΔE for reverse reaction is C - A

Answer: B

66. The rate of a reaction, $2A + 3B + 4C \rightarrow$ products, is equal to $R = [A]^2[B]^3[C]^4$. The overall order of the reaction is

A. 9

B. 5

C. 5

D. 3

Answer: A

67. For a reaction $A + B \rightarrow$ Products, the rate of the reaction was doubled, when concentration of-A was doubled. When the concentration of A and B were doubled, the rate was again doubled. The order of the reaction with respect to A and B are respectively.

A. 1,1

B. 2,0

C. 1,0

D. 0,1

Answer: C

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68. The unit of rate of first order reaction is

A. s^{-1}

B. s^{-1}

C. $mol L^{-1} s^{-1}$

D. No units

Answer: C

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69. The time tor half - life of a first order reaction is 1 h. What is the time taken for 87.5% completion of the reaction?

A. lh

B. 3h

C. 2h

D. 4h

Answer: C

70. If a reaction obeys the following equation

$$k = \frac{2.303}{t} \log_{10} \left(\frac{a}{a-x} \right),$$ the order of the reaction will be

A. Zero order

B. Second order

C. First order

D. Third order

Answer: B

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71. The rate of reaction is generally doubled for .... rise in temperature.

A. $20° C$

B. $10° C$

C. $100° C$

D. None of the above

Answer: B

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