

chemical Cell and
chemical Series

s | $Zn^{2+}(aq) \parallel M^{2+}(aq) | M(s)$,
lls and their standard electrode
iven below

$Ag^{+}(aq)/Ag(s)$	$Fe^{3+}(aq)/Fe^{2+}(aq)$	$Fe^{2+}(aq)/Fe(s)$
0.80	0.77	-0.44

6 V, which cathode will give a
of E°_{cell} per electron transferred?

[JEE (Main)-2019]

 $_{23}^{19}H_2O = +1.23 V$ $_{23}^{19}O_2^{+}/SO_4^{2-} = +2.05 V$ $_{23}^{19}Br^- = +1.09 V$ $_{23}^{19}Au^{3+}/Au = +1.4 V$

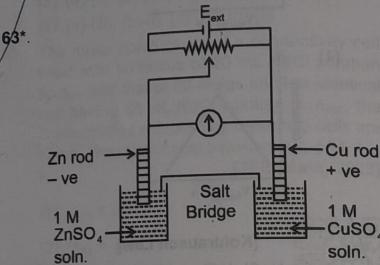
oxidizing agent is

[JEE (Main)-2019]

- (2) Au^{3+}
(4) O_2

standard cell potential (in V) of
following reaction takes place:
 $(aq) \rightarrow Fe^{3+}(aq) + Ag(s)$

- (1) $Co^{3+} < Ce^{4+} < Bi^{3+} < Pb^{4+}$
(2) $Co^{3+} < Pb^{4+} < Ce^{4+} < Bi^{3+}$
(3) $Ce^{4+} < Pb^{4+} < Bi^{3+} < Co^{3+}$
(4) $Bi^{3+} < Ce^{4+} < Pb^{4+} < Co^{3+}$

 $E^\circ_{Cu^{2+}/Cu} = +0.34 V$ $E^\circ_{Zn^{2+}/Zn} = -0.76 V$

Identify the incorrect statement from the option
below for the above cell [JEE (Main)-2020]

- (1) If $E_{ext} < 1.1 V$, Zn dissolves at anode and
Cu deposits at cathode
(2) If $E_{ext} = 1.1 V$, no flow of e^- or current occurs
(3) If $E_{ext} > 1.1 V$, e^- flows from Cu to Zn
(4) If $E_{ext} > 1.1 V$, Zn dissolves at Zn electrode
and Cu deposits at Cu electrode

- 64*. The correct order of reduction potentials of the
following pairs is [JEE (Main)-2022]

- (A) Cl_2/Cl^- (B) I_2/I^-
(C) Ag^{+}/Ag (D) Na^+/Na
(E) Li^{+}/Li

Choose the correct answer from the options
given below:

- (1) A > C > B > D > E (2) A > B > C > D > E
(3) A > C > B > E > D (4) A > B > C > E > D

- 65*. Which of the following has least tendency to
liberate H_2 from mineral acids?

[JEE (Main)-2022]

- (1) Cu
(2) Mn
(3) Ni
(4) Zn

 $Fe^{2+}; E^\circ = +1.81 V$ $Br^{2-}; E^\circ = +1.09 V$ $^{23}^{19}O; E^\circ = +1.61 V$ $Fe^{2+}; E^\circ = +0.20 V$

er of the species will increase in
[JEE (Main)-2019]



66. Which one of the following statements is correct
for electrolysis of brine solution?

[JEE (Main)-2023]

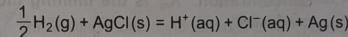
- (1) Cl_2 is formed at cathode
(2) H_2 is formed at anode
(3) O_2 is formed at cathode
(4) OH^- is formed at cathode

- 67*. The product, which is not obtained during the
electrolysis of brine solution is

[JEE (Main)-2023]

- (1) H_2 (2) HCl
(3) $NaOH$ (4) Cl_2

68. The reaction



occurs in which of the given galvanic cell?

[JEE (Main)-2023]

- (1) $Pt|H_2(g)|HCl(soln)|AgCl(s)|Ag$
(2) $Ag|AgCl(s)|KCl(soln)|AgNO_3|Ag$
(3) $Pt|H_2(g)|HCl(soln)|AgNO_3(soln)|Ag$
(4) $Pt|H_2(g)|KCl(soln)|AgCl(s)|Ag$

[Nernst Equation, Concentration Cell,
Type of Electrode]

- 69*. In the cell

$Pt(s) | H_2(g, 1 \text{ bar}) | HCl(aq) | AgCl(s) | Ag(s) | Pt(s)$
the cell potential is 0.92 V when a 10^{-6} molal
HCl solution is used. The standard electrode
potential of $(AgCl/Ag, Cl^-)$ electrode is

$$\left\{ \text{Given, } \frac{2.303RT}{F} = 0.06 \text{ V at } 298 \text{ K} \right\}$$

[JEE (Main)-2019]

- (1) 0.20 V (2) 0.40 V
(3) 0.76 V (4) 0.94 V

70. For the given cell;

$Cu(s) | Cu^{2+}(C_2M) \parallel Cu^{2+}(C_1M) | Cu(s)$
 change in Gibbs energy (ΔG) is negative, if

[JEE (Main)-2020]

- (1) $C_2 = \sqrt{2} C_1$ (2) $C_2 = \frac{C_1}{\sqrt{2}}$
(3) $C_1 = 2C_2$ (4) $C_1 = C_2$

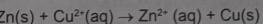
[E°_{cell} and Thermodynamic Factors]

If the standard electrode potential for a cell is
2 V at 300 K, the equilibrium constant (K) for the
reaction $Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(s)$
at 300 K is approximately
($R = 8 \text{ JK}^{-1} \text{ mol}^{-1}$, $F = 96000 \text{ C mol}^{-1}$)

[JEE (Main)-2019]

- (1) e^{320} (2) e^{160}
(3) e^{-160} (4) e^{-80}

- 72*. The standard electrode potential E° and its
temperature coefficient $\left(\frac{dE^\circ}{dT}\right)$ for a cell are
2 V and $-5 \times 10^{-4} \text{ VK}^{-1}$ at 300 K respectively.
The cell reaction is



The standard reaction enthalpy (Δ_rH°) at
300 K in kJ mol^{-1} is,

[Use $R = 8 \text{ JK}^{-1} \text{ mol}^{-1}$ and $F = 96,000 \text{ C mol}^{-1}$]

[JEE (Main)-2019]

- (1) 206.4
(2) -384.0
(3) -412.8
(4) 192.0



73. The standard Gibbs energy for the given cell
reaction in kJ mol^{-1} at 298 K is

 $E^\circ = 2 \text{ V at } 298 \text{ K}$ (Faraday's constant, $F = 96000 \text{ C mol}^{-1}$)

[JEE (Main)-2019]

- (1) 192 (2) 384
(3) -384 (4) -192



74. The $(\frac{\partial E}{\partial T})_p$ of different types of half cells are
as follows:

$$A \quad B \quad C \quad D$$

$$1 \times 10^{-4} \quad 2 \times 10^{-4} \quad 0.1 \times 10^{-4} \quad 0.2 \times 10^{-4}$$

(where E is the electromotive force)

Which of the above half cells would be preferred
to be used as reference electrode?

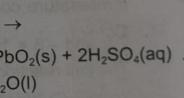
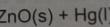
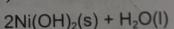
[JEE (Main)-2022]

- (1) A (2) B
(3) C (4) D



Batteries
strong oxidizing agent
it is the part of lead
and A is
[JEE (Main)-2021]

PbSO₄
PbO₂



secondary battery

answer from the options
[JEE (Main)-2022]

II), (D)-(IV)
III), (D)-(III)-
IV), (D)-(III)-
III), (D)-(IV)

estions

Conductivity

conductivity cell with cell
taining 0.001 M KCl at
molar conductivity of
298 K in $\text{S cm}^2 \text{ mol}^{-1}$
[JEE (Main)-2021]

if mercury at 0°C is
the resistance of a cell
 0.243Ω , then the cell
 $\times 10^4 \text{ m}^{-1}$. The value of x
is [JEE (Main)-2021]

conductivity 0.14 S m^{-1}
4.19 Ω in conductivity
it is filled with x
the drops of 1.03 Ω . The
Cl solution is \times
to the Nearest Integer).
[JEE (Main)-2021]

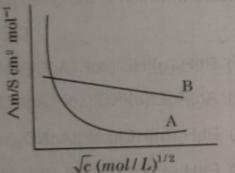
Galaxy F13

11:58 am

80. Resistance of a conductivity cell (cell constant 129 m^{-1}) filled with 74.5 ppm solution of KCl is 100 Ω (labelled as solution 1). When the same cell is filled with KCl solution of 149 ppm, the resistance is 50 Ω (labelled as solution 2). The ratio of molar conductivity of solution 1 and solution 2 is $\frac{\Lambda_1}{\Lambda_2} = x \times 10^{-3}$. The value of x is _____. (Nearest integer)
(Given : molar mass of KCl is 74.5 g mol^{-1}). [JEE (Main)-2022]



- 81*. Following figure shows dependence of molar conductance of two electrolytes on concentration. Λ_m^0 is the limiting molar conductivity.



The number of incorrect statement(s) from the following is _____

- (A) Λ_m^0 for electrolyte A is obtained by extrapolation.
(B) For electrolyte B, Λ_m vs \sqrt{c} graph is a straight line with intercept equal to Λ_m^0 .
(C) At infinite dilution, the value of degree of dissociation approaches zero for electrolyte B.
(D) Λ_m^0 for any electrolyte A or B can be calculated using λ^0 for individual ions. [JEE (Main)-2023]

82. 1×10^{-6} M AgNO₃ is added to 1 L of saturated solution of AgBr. The conductivity of this solution at 298 K is $\times 10^{-6} \text{ S m}^{-1}$.
(Given : K_{SP}(AgBr) = 4.9 $\times 10^{-9}$ at 298 K)

$$\lambda_{\text{Ag}^+} = 6 \times 10^{-3} \text{ S m}^2 \text{ mol}^{-1}$$

$$\lambda_{\text{Br}^-} = 8 \times 10^{-3} \text{ S m}^2 \text{ mol}^{-1}$$

$$\lambda_{\text{NO}_3^-}^0 = 7 \times 10^{-3} \text{ S m}^2 \text{ mol}^{-1}$$

[JEE (Main)-2023]

[Kohlrausch Law]

83. The molar conductivities at infinite dilution of barium chloride, sulphuric acid and hydrochloric acid are 280, 860 and 426 $\text{S cm}^2 \text{ mol}^{-1}$ respectively. The molar conductivity at infinite dilution of barium sulphate is ____ $\text{S cm}^2 \text{ mol}^{-1}$. (Round off to the Nearest Integer). [JEE (Main)-2021]



84. The conductivity of a weak acid HA of concentration 0.001 mol L^{-1} is $2.0 \times 10^{-5} \text{ S cm}^{-1}$.

If $\Lambda_m^0(\text{HA}) = 190 \text{ S cm}^2 \text{ mol}^{-1}$, the ionization constant (K_a) of HA is equal to $\times 10^{-6}$. (Round off to the Nearest Integer)

[JEE (Main)-2021]

85. The limiting molar conductivities of NaI, NaNO₃ and AgNO₃ are 12.7, 12.0 and 13.3 $\text{mS m}^2 \text{ mol}^{-1}$, respectively (all at 25°C). The limiting molar conductivity of AgI at this temperature is _____ $\text{mS m}^2 \text{ mol}^{-1}$. [JEE (Main)-2022]

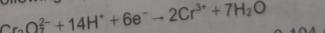
86. The solubility product of a sparingly soluble salt A_2X_3 is 1.1×10^{-23} . If specific conductance of the solution is $3 \times 10^{-5} \text{ S m}^{-1}$, the limiting molar conductivity of the solution is $x \times 10^{-3} \text{ S m}^2 \text{ mol}^{-1}$. The value of x is _____. [JEE (Main)-2022]

[JEE (Main)-2022]

[Faraday's Law]

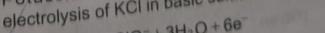
87. 108 g of silver (molar mass 108 g mol^{-1}) is deposited at cathode from AgNO₃(aq) solution by a certain quantity of electricity. The volume (in L) of oxygen gas produced at 273 K and 1 bar pressure from water by the same quantity of electricity is _____. [JEE (Main)-2020]

- 88*. An acidic solution of dichromate is electrolyzed for 8 minutes using 2 A current. As per the following equation



The amount of Cr³⁺ obtained was 0.104 g. The efficiency of the process (in %) is (Take : F = 96000 C, At. mass of chromium = 52) [JEE (Main)-2020]

89. Potassium chloride is prepared by the electrolysis of KCl in basic solution



If only 60% of the current is utilized in the reaction, the time (rounded to the nearest

hour) required to produce 10 g of KClO₃ using a current of 2 A is _____. (Given : F = 96,500 C mol^{-1} ; molar mass of KClO₃ = 122 g mol^{-1}) [JEE (Main)-2020]

90. Potassium chloride is prepared by electrolysis of KCl in basic solution as shown by following equation.



A current of x A has to be passed for 10 h to produce 10.0 g of potassium chloride. The value of x is _____. (Nearest integer)

(Molar mass of KClO₃ = 122.6 g mol^{-1} , F = 96500 C) [JEE (Main)-2021]

91. Consider the following reaction
 $\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$, E° = 1.51 V. The quantity of electricity required in Faraday to reduce five moles of MnO₄⁻ is _____. (Integer answer) [JEE (Main)-2021]

92. A solution of Fe₂(SO₄)₃ is electrolyzed for 'x' min with a current of 1.5 A to deposit 0.3482 g of Fe. The value of x is _____. [nearest integer]
Given : 1 F = 96500 C mol^{-1}
Atomic mass of Fe = 56 g mol^{-1} [JEE (Main)-2022]

93. The quantity of electricity of Faraday needed to reduce 1 mol of Cr₂O₇²⁻ to Cr²⁺ is _____. [JEE (Main)-2022]

94. A dilute solution of sulphuric acid is electrolysed using a current of 0.10 A for 2 hours to produce hydrogen and oxygen gas. The total volume of gases produced at STP is ____ cm^3 . (Nearest integer)
[Given : Faraday constant F = 96500 C mol^{-1} at STP, molar volume of an ideal gas is 22.7 L mol^{-1}] [JEE (Main)-2022]

95. The amount of charge in F(Faraday) required to obtain one mole of iron from Fe₂O₃ is _____. (Nearest integer) [JEE (Main)-2022]

- 96*. A metal surface of 100 cm^2 area has to be coated with nickel layer of thickness 0.001 mm. A current of 2 A was passed through a solution of Ni(NO₃)₂ for 'x' seconds to coat the desired layer. The value of x is _____. (Nearest integer)
(ρ_{Ni} (density of Nickel) is 10 g mL^{-1} , Molar mass of Nickel is 60 g mol^{-1} F = 96500 C mol^{-1}) [JEE (Main)-2023]

$W \approx 1 \text{ g} = ?$

[Electrochemical Cell and Electrochemical Series]

97. In a cell, the following reactions take place



The standard electrode potential for the spontaneous reaction in the cell is $x \times 10^{-2}$ V at 208 K. The value of x is _____ (Nearest Integer)

[JEE (Main)-2022]

98. The standard reduction potentials at 295 K for the following half cells are given below:

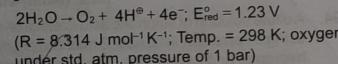
$\text{NO}_3^- + 4\text{H}^+ + 3\text{e}^- \rightarrow \text{NO}(\text{g}) + 2\text{H}_2\text{O}$	$E^{\circ} = 0.97 \text{ V}$
$\text{V}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{V}$	$E^{\circ} = -1.19 \text{ V}$
$\text{Fe}^{3+}(\text{aq}) + 3\text{e}^- \rightarrow \text{Fe}$	$E^{\circ} = -0.04 \text{ V}$
$\text{Ag}^+(\text{aq}) + \text{e}^- \rightarrow \text{Ag}(\text{s})$	$E^{\circ} = 0.80 \text{ V}$
$\text{Au}^{3+}(\text{aq}) + 3\text{e}^- \rightarrow \text{Au}(\text{s})$	$E^{\circ} = 1.40 \text{ V}$

The number of metal(s) which will be oxidized by NO_3^- in aqueous solution is _____.

[JEE (Main)-2023]

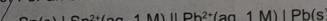
[Nernst Equation, Concentration Cell, Type of Electrode]

99*. What would be the electrode potential for the given half cell reaction at pH = 5?

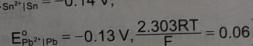


[JEE (Main)-2020]

100. For an electrochemical cell,



the ratio $\frac{[\text{Sn}^{2+}]}{[\text{Pb}^{2+}]}$ when this cell attains equilibrium is _____.

(Given: $E_{\text{Sn}^{2+}/\text{Sn}}^{\circ} = -0.14 \text{ V}$,

[JEE (Main)-2020]

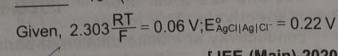
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The photoelectric current from Na (work function, $w_0 = 2.3$ eV) is stopped by the output voltage of the cell



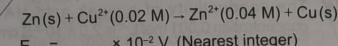
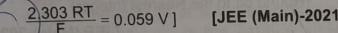
$\text{Pt}(\text{s}) | \text{H}_2(\text{g}, 1 \text{ bar}) | \text{HCl}(\text{aq}, \text{pH} = 1) | \text{AgCl}(\text{s}) | \text{Ag}(\text{s})$

The pH of the aq. HCl required to stop the photoelectric current from $K(w_0 = 2.25 \text{ eV})$, all other conditions remaining the same, is _____ $\times 10^{-2}$ (to the nearest integer).

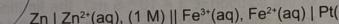


[JEE (Main)-2020]

102. For the galvanic cell,

(Given : $E_{\text{Cu}/\text{Cu}^{2+}}^{\circ} = -0.34 \text{ V}$, $E_{\text{Zn}/\text{Zn}^{2+}}^{\circ} = +0.76 \text{ V}$,103. For the cell $\text{Cu}(\text{s}) | \text{Cu}^{2+}(\text{aq}, 0.1 \text{ M}) \parallel \text{Ag}^+(\text{aq}, 0.01 \text{ M}) | \text{Ag}(\text{s})$ the cell potential $E = 0.3095 \text{ V}$ For the cell $\text{Cu}(\text{s}) | \text{Cu}^{2+}(\text{aq}, 0.01 \text{ M}) \parallel \text{Ag}^+(\text{aq}, 0.001 \text{ M}) | \text{Ag}(\text{s})$ the cell potential = $\text{_____} \times 10^{-3} \text{ V}$. (Round off to the Nearest Integer).(Given : $\frac{2.303\text{RT}}{F} = 0.059 \text{ V}$) [JEE (Main)-2021]

104. Consider the cell at 25°C



The fraction of total iron present as Fe^{3+} ion at the cell potential of 1.500 V is $x \times 10^{-3}$. The value of x is _____ (Nearest integer)

(Given : $E_{\text{Fe}^{3+}/\text{Fe}^{2+}}^{\circ} = 0.77 \text{ V}$, $E_{\text{Zn}^{2+}/\text{Zn}}^{\circ} = -0.76 \text{ V}$)

[JEE (Main)-2021]

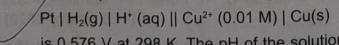
105. The magnitude of the change in oxidising power of the $\text{MnO}_4^-/\text{Mn}^{2+}$ couple is $x \times 10^{-4} \text{ V}$, if the H^+ concentration is decreased from 1 M to 10^{-4} M at 25°C. (Assume concentration of MnO_4^- and Mn^{2+} to be same on change in H^+ concentration). The value of x is _____

(Rounded off to the nearest integer)

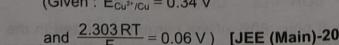
(Given: $\frac{2.303\text{RT}}{F} = 0.059$)

[JEE (Main)-2021]

106. The cell potential for the following cell

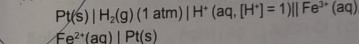


is 0.576 V at 298 K. The pH of the solution is _____ (Nearest integer)

(Given : $E_{\text{Cu}/\text{Cu}^{2+}}^{\circ} = 0.34 \text{ V}$,107. The cell potential for $\text{Zn} | \text{Zn}^{2+}(\text{aq}) \parallel \text{Sn}^{4+} | \text{Sn}$ is 0.801 V at 298 K. The reaction quotient for the above reaction is 10^{-2} . The number of electrons involved in the given electrochemical cell reaction is _____.Given: $E_{\text{Zn}^{2+}/\text{Zn}}^{\circ} = -0.763 \text{ V}$, $E_{\text{Sn}^{4+}/\text{Sn}}^{\circ} = +0.008 \text{ V}$ and $\frac{2.303\text{RT}}{F} = 0.06 \text{ V}$ [JEE (Main)-2022]108. At 298 K, a 1 litre solution containing 10 mmol of $\text{Cr}_2\text{O}_7^{2-}$ and 100 mmol of Cr^{3+} shows a pH of 3.0.Given: $\text{Cr}_2\text{O}_7^{2-} \rightarrow \text{Cr}^{3+}$, $E^{\circ} = 1.330 \text{ V}$ and $\frac{2.303\text{RT}}{F} = 0.059 \text{ V}$ The potential for the half cell reaction is $x \times 10^{-3} \text{ V}$. The value of x is _____.

[JEE (Main)-2023]

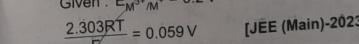
109. Consider the cell

Given $E_{\text{Fe}^{3+}/\text{Fe}^{2+}}^{\circ} = 0.771 \text{ V}$ and $E_{\text{H}^+/[\text{H}_2\text{O}_2]}^{\circ} = 0 \text{ V}$, $T = 298 \text{ K}$ If the potential of the cell is 0.712 V, the ratio of concentration of Fe^{2+} to Fe^{3+} is _____ (Nearest integer)

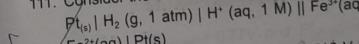
[JEE (Main)-2023]

110. $\text{Pt}(\text{s}) | \text{H}_2(\text{g}, 1 \text{ bar}) | \text{H}^+(\text{aq}, 1 \text{ M}) | \text{M}^{3+}(\text{aq}), \text{M}^{2+}(\text{aq}) | \text{Pt}(\text{s})$ The E_{cell} for the given cell is 0.1115 V at 298 K when $\frac{[\text{M}^{2+}(\text{aq})]}{[\text{M}^{3+}(\text{aq})]} = 10^a$

The value of a is _____.

Given : $E_{\text{M}^{3+}/\text{M}^{2+}}^{\circ} = 0.2 \text{ V}$ 

111. Consider the cell

When the potential of the cell is 0.712 V at 298 K, the ratio $[\text{Fe}^{2+}] / [\text{Fe}^{3+}]$ is _____.

(Nearest integer)

Given: $\text{Fe}^{3+} + \text{e}^- \rightleftharpoons \text{Fe}^{2+}$, $E^{\circ} = 0.771 \text{ V}$ and $\frac{2.303\text{RT}}{F} = 0.06 \text{ V}$ [JEE (Main)-2023]112*. The electrode potential of the following half cell at 298 K $X | X^{2+}(0.001 \text{ M}) \parallel Y^{2+}(0.01 \text{ M}) | Y$ is $x \times 10^{-2} \text{ V}$ (Nearest integer).

[JEE (Main)-2022]

Given : $E_{\text{X}^{2+}/\text{X}}^{\circ} = -0.236 \text{ V}$ $E_{\text{Y}^{2+}/\text{Y}}^{\circ} = +0.36 \text{ V}$

$$\frac{2.303\text{RT}}{F} = 0.06 \text{ V}$$
 [JEE (Main)-2023]

113. The logarithm of equilibrium constant for the reaction $\text{Pd}^{2+} + 4\text{Cl}^- \rightleftharpoons \text{PdCl}_4^{2-}$ is _____ (Nearest integer)

$$\frac{2.303\text{RT}}{F} = 0.06 \text{ V}$$
 [JEE (Main)-2022]

Given : $\text{Pd}^{2+} + 2\text{e}^- \rightarrow \text{Pd}(\text{s})$, $E^{\circ} = 0.83 \text{ V}$ and $\text{PdCl}_4^{2-} + 2\text{e}^- \rightarrow \text{Pd}(\text{s}) + 4\text{Cl}^-$, $E^{\circ} = 0.65 \text{ V}$ [JEE (Main)-2023]114*. At 298 K, the standard reduction potential for Cu^{2+}/Cu electrode is 0.34 V.

$$\text{Given : } K_{\text{sp}} \text{ Cu}(\text{OH})_2 = 1 \times 10^{-20}$$

$$\text{Take } \frac{2.303\text{RT}}{F} = 0.059 \text{ V}$$

The reduction potential at pH = 14 for the above couple is $(-x) \times 10^{-2} \text{ V}$.

The value of x is _____.

[E_{cell} and Thermodynamic Factors]115. For the disproportionation reaction $2\text{Cu}^{2+}(\text{aq}) \rightleftharpoons \text{Cu}(\text{s}) + \text{Cu}^{2+}(\text{aq})$ at 298 K. In K (where K is the equilibrium constant) is $\text{_____} \times 10^{-1}$.

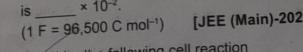
$$\text{Given : } E_{\text{Cu}^{2+}/\text{Cu}^{2+}}^{\circ} = 0.16 \text{ V}; E_{\text{Cu}^{2+}/\text{Cu}}^{\circ} = 0.52 \text{ V}$$

$$\frac{RT}{F} = 0.025$$
 [JEE (Main)-2020]

116. An oxidation-reduction reaction in which 3 electrons are transferred has a ΔG° of 17.37 KJ mol⁻¹ at 25°C. The value of E_{cell}° (in V) is $\text{_____} \times 10^{-2}$.

$$(1 \text{ F} = 96,500 \text{ C mol}^{-1})$$
 [JEE (Main)-2020]

117*. Consider the following cell reaction

The value of E_{cell}° is 4.315 V at 25°C. If $\Delta H^\circ = -825 \text{ kJ mol}^{-1}$, the standard entropy change ΔS° in J K^{-1} is _____ (Nearest integer)

[JEE (Main)-2021]

Given : Faraday constant = 96487 C mol⁻¹

[JEE (Main)-2020]



f $\frac{AD}{B}$ is
[JEE (Main)-2021]

- (2) $[M^0 L T^{-1}]$
(4) $[M L^2 T^{-3}]$

time (T) are taken as the
then what will be dimension
[JEE (Main)-2021]

- (2) $[FL^{-3} T^3]$
(4) $[FL^{-5} T^2]$

ratio (a) in two systems of
related as $v_2 = \frac{n}{m^2} v_1$ and
ely. Here m and n are
ons for distance and time in
vely are :

[JEE (Main)-2022]

$$\frac{n^2}{m} T_1 = T_2$$

$$T_1 = \frac{n^2}{m} T_2$$

$$T_1 = \frac{n^4}{m^2} T_2$$

$$\frac{n^4}{m^2} T_1 = T_2$$

Significant Figures

height of a cylinder are
er scale to be 12.6 ± 0.1 cm
respectively. What will be the
e in appropriate significant
[JEE (Main)-2019]

- (2) 4300 ± 80 cm³
(4) 4264.4 ± 81.0 cm³

is being used to determine the
l acceleration g at a certain
f the pendulum is 25.0 cm and
s resolution measures the time
tion to be 50 s. The accuracy
[JEE (Main)-2020]

- (2) 2.40%
(4) 4.40%

45. A physical quantity
- z
- depends on four observables

a, b, c and d , as $z = \frac{a^2 b^3}{\sqrt{c d^3}}$. The percentages of error in the measurement of a, b, c and d are 2%, 1.5%, 4% and 2.5% respectively. The percentage of error in z is

- (1) 13.5%
(2) 14.5%
(3) 16.5%
(4) 12.25%

46. A wire of 1Ω has a length of 1 m. It is stretched till its length increases by 25%. The percentage change in resistance to the nearest integer is

- (1) 76%
(2) 56%
(3) 12.5%
(4) 25%

47. In the experiment of Ohm's law, a potential difference of 5.0 V is applied across the end of a conductor of length 10.0 cm and diameter of 5.00 mm. The measured current in the conductor is 2.00 A. The maximum permissible percentage error in the resistivity of the conductor is:

[JEE (Main)-2021]

- (1) 3.0
(2) 3.9
(3) 7.5
(4) 8.4

48. If the length of the pendulum in pendulum clock increases by 0.1%, then the error in time per day is:

[JEE (Main)-2021]

49. Two resistors $R_1 = (4 \pm 0.8) \Omega$ and $R_2 = (4 \pm 0.4) \Omega$ are connected in parallel. The equivalent resistance of their parallel combination will be :

[JEE (Main)-2021]

- (1) $(4 \pm 0.4) \Omega$
(2) $(2 \pm 0.4) \Omega$
(3) $(2 \pm 0.3) \Omega$
(4) $(4 \pm 0.3) \Omega$

50. If $Z = \frac{A^2 B^3}{C^4}$, then the relative error in Z will be

[JEE (Main)-2022]

- (1) $\frac{\Delta A}{A} + \frac{\Delta B}{B} + \frac{\Delta C}{C}$
(2) $\frac{2\Delta A}{A} + \frac{3\Delta B}{B} - \frac{4\Delta C}{C}$
(3) $\frac{2\Delta A}{A} + \frac{3\Delta B}{B} + \frac{4\Delta C}{C}$
(4) $\frac{\Delta A}{A} + \frac{\Delta B}{B} - \frac{\Delta C}{C}$

51. A silver wire has a mass (0.6 ± 0.006) g, radius (0.5 ± 0.005) mm and length (4 ± 0.04) cm. The maximum percentage error in the measurement of its density will be

- (1) 4%
(2) 3%
(3) 6%
(4) 7%

[JEE (Main)-2022]

52. A torque meter is calibrated to reference standards of mass, length and time each with 5% accuracy. After calibration, the measured torque with this torque meter will have net accuracy of

[JEE (Main)-2022]

- (1) 15%
(2) 25%
(3) 75%
(4) 5%

 $ML^2 T^{-2}$

$$5 + 10 \times 10 = 25\%$$

53. If the radius of earth shrinks by 2% while its mass remains same. The acceleration due to gravity on the earth's surface will approximately

[JEE (Main)-2022]

- (1) Decrease by 2%
(2) Decrease by 4%
(3) Increase by 2%
(4) Increase by 4%

$$g = \frac{GM}{R^2}$$

54. An aluminium wire is stretched to make its length, 0.4% larger. The percentage change in resistance is:

[JEE (Main)-2022]

- (1) 0.4%
(2) 0.2%
(3) 0.8%
(4) 0.6%

$$\frac{\Delta R}{R} = \frac{\Delta L}{L} = \frac{\Delta A}{A}$$

55. The maximum error in the measurement of resistance, current and time for which current flows in an electrical circuit are 1%, 2% and 3% respectively. The maximum percentage error in the detection of the dissipated heat will be

[JEE (Main)-2022]

- (1) 2
(2) 4
(3) 6
(4) 8

$$\frac{\Delta P}{P} = \frac{\Delta I}{I} + \frac{\Delta V}{V} + \frac{\Delta t}{t}$$

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[Miscellaneous]

56. A huge circular arc of length 4.4 ly subtends an angle '4s' at the centre of the circle. How long it would take for a body to complete 4 revolution if its speed is 8 AU per second?

Given: 1 ly = 9.46×10^{15} m1 AU = 1.5×10^{11} m [JEE (Main)-2021]

- (1) 3.5×10^8 s
(2) 4.5×10^{10} s
(3) 4.1×10^8 s
(4) 7.2×10^8 s

Numerical Value Based Questions

57. The density of a solid metal sphere is determined by measuring its mass and its diameter. The maximum error in the density of the sphere is

$\left(\frac{x}{100}\right)\%$. If the relative errors in measuring the mass and the diameter are 6.0% and 1.5% respectively, the value of x is 1050.00

[JEE (Main)-2020]

58. The resistance $R = \frac{V}{I}$, where $V = (50 \pm 2)$ V and $I = (20 \pm 0.2)$ A. The percentage error in R is ' x '%.

The value of ' x ' to the nearest integer is 5.0.

[JEE (Main)-2021]

59. The radius of a sphere is measured to be (7.50 ± 0.85) cm. Suppose the percentage error in its volume is x .

The value of x , to the nearest x , is 34.

[JEE (Main)-2021]

60. The acceleration due to gravity is found upto an accuracy of 4% on a planet. The energy supplied to a simple pendulum of known mass 'm' to undertake oscillations of time period T is being estimated. If time period is measured to an accuracy of 3%, the accuracy to which E is known as 14 %.

[JEE (Main)-2021]

61. For $z = a^2 x^3 y^2$, where 'a' is a constant. If percentage error in measurement of 'x' and 'y' are 4% and 12%, respectively, then the percentage error for 'z' will be 18 %. [JEE (Main)-2022]

d Measurement

ory measures thickness
auge. The readings are
9 mm and 1.20 mm. The

$\frac{x}{21}$ %. The value of x is

[JEE (Main)-2022]

acceleration due to gravity
um, time period of 0.5 s is

measured from time of 100 oscillations with a resolution of 1 s. If measured value of length is 1 cm known to 1 mm accuracy, the accuracy in the determination of g is found to be x%. The value of x is _____

[JEE (Main)-2022]

64. The length of a given cylindrical wire is increased to double of its original length. The percentage increase in the resistance of the wire will be

300 %.

[JEE (Main)-2022]

□ □ □

$$\frac{\Delta l}{l} + \frac{2\Delta t}{t}$$

$$\frac{0.01}{0.01} + \frac{2 \times 1}{2000}$$

EXERCISE 2.1

Position, path length and displacement, Average velocity and Average speed, Instantaneous velocity and Instantaneous speed

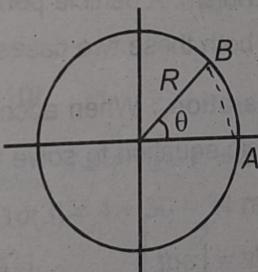
1. A person moves 30 m north, then 20 m east and then $30\sqrt{2}$ m south-west. His displacement from the origin position is

- (1) 14 m south-west
- (2) 28 m south
- (3) 10 m west
- (4) 15 m east

2. A car moves a distance of 200 m. It covers the first half of the distance at speed 40 km/h and second half of the distance at speed v . The average speed is 48 km/h. The value of v is

- (1) 56 km/h
- (2) 60 km/h
- (3) 50 km/h
- (4) 58 km/h

3. A particle moves from A to B in a circular path of radius R covering an angle θ as shown in figure. Find the ratio of distance and magnitude of displacement of the particle.



$$(2) \frac{\theta}{\sin \theta}$$

$$(1) \frac{\theta}{2 \sin \frac{\theta}{2}}$$

$$(3) \frac{\theta}{2 \sin \theta}$$

$$(4) \frac{\theta}{\sin \frac{\theta}{2}}$$

4. A student goes from his house to his friend's house with speed v_1 . Finding the door of his friend's closed, return back to his own house with the speed v_2 . Then the average speed of the student is

$$(2) \sqrt{v_1 v_2}$$

$$(1) \frac{v_1 + v_2}{2}$$

$$(3) \frac{2v_1 v_2}{v_1 + v_2}$$

$$(4) v_1 v_2$$

daily at a fixed speed. But today he decided to reduce his speed daily by a fixed percentage. He covers the actual/original time he takes to reach

EXERCISE 2.4

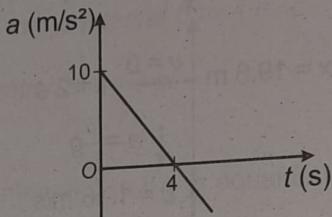
[Freely falling objects]

16. In this problem "up" is taken to be positive. A ball thrown vertically upward with an initial velocity of 19.6 m/s , after 5 s has a velocity of
- (1) 19.6 m/s
 - (2) -19.6 m/s
 - (3) 29.4 m/s
 - (4) -29.4 m/s
17. Ball A is thrown upward at the same time as ball B and with half the speed of ball B. Which of the following is true?
- (1) They will hit the ground at the same time
 - (2) A will hit before B
 - (3) B will hit before A
 - (4) Not enough information is given
18. A stone falls from rest. The distance covered by it in the last second of its motion is equal to the distance covered in the first three seconds. What is the height from which the stone was dropped? [Take $g = 10 \text{ m/s}^2$]
- (1) 25 m
 - (2) 100 m
 - (3) 125 m
 - (4) 200 m
19. A particle is dropped from the top of a high tower, then the distance covered in the fifth second of its fall is
- (1) 25 m
 - (2) 50 m
 - (3) 45 m
 - (4) 15 m

EXERCISE 2.5

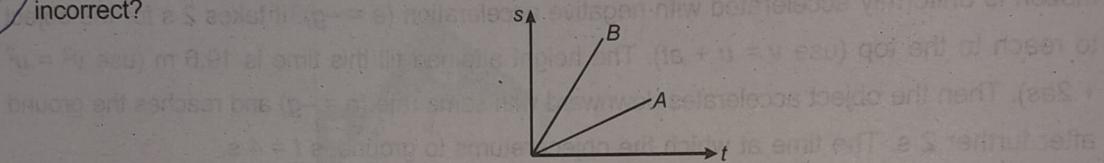
[Kinematical quantities on Graphs, Graphs for uniform motion]

21. The acceleration-time graph of a particle is as shown. At what time the particle acquires its initial velocity?



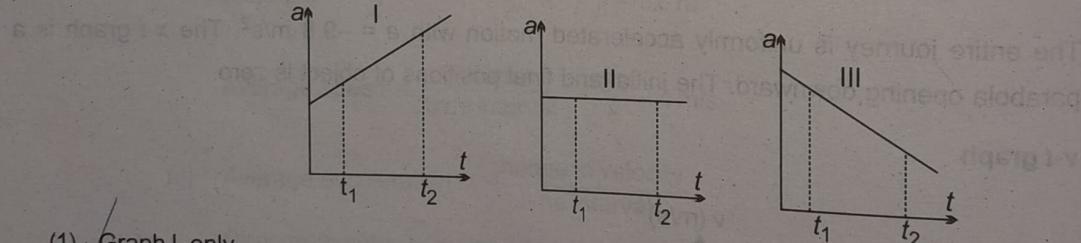
- (1) 12 s
(2) 5 s
(3) 8 s
(4) 16 s

22. The displacement (s)-time (t) graph of two cars A and B are shown in figure. Which of the following statement is incorrect?



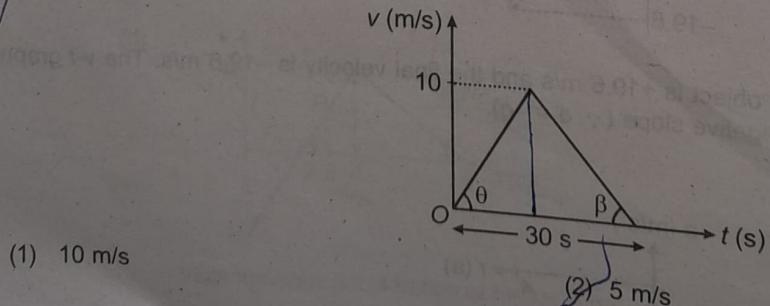
- (1) Both the cars moving with uniform velocities
(2) Car B is faster than Car A
(3) Both the cars are moving with non-uniform acceleration
(4) Both are moving with constant speeds

23. Each of the three graphs represents acceleration versus time for an object that already has a positive velocity at time t_1 . Which graphs show an object whose speed is increasing for the entire time interval between t_1 and t_2 ?



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

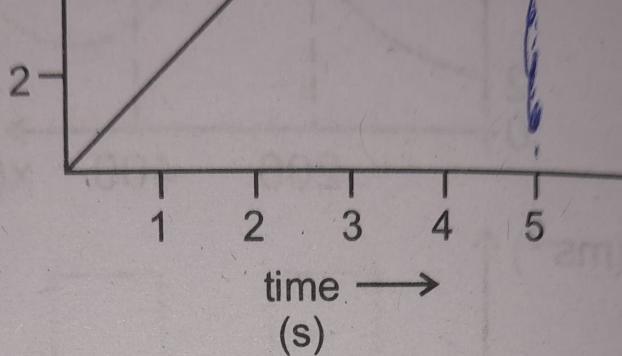
24. A particle obeys the following v - t graph as shown. The average velocity over 30 s is



- (1) 10 m/s
(3) $\frac{15}{3}$ m/s
(2) 5 m/s
(4) Zero

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65. Two spherical balls having equal masses with radius of 5 cm each are thrown upwards along the same vertical direction at an interval of 3 s with the same initial velocity of 35 m/s, then these balls collide at a height of ____ m. (take $g = 10 \text{ m/s}^2$)

[JEE (Main)-2021]

