Hohete Tibeb Share Company
Education and Technology Team
Ethio-Parents' Schools: Addis Ababa (Gerji/ Gullele) and Hawassa.
Chemistry 10th work sheet for Grade 12

Name:_____

The questions in this work sheet are multiple choice types. Read each question thoroughly and write your answer on your own separate answer sheet.

1. Which of the following has been universally accepted as a reference electrode at all temperatures and has been assigned a value of zero volt?
   (a) platinum electrode
   (b) graphite electrode
   (c) copper electrode
   (d) standard hydrogen electrode

2. The reaction
   $\frac{1}{2}H_2(g) + AgCl(s) \rightarrow H^+(aq) + Cl^-(aq) + Ag(s)$ occurs in the galvanic cell
   (a) $Ag/AgCl(s)/KCl(sol.)//AgNO_3(sol.)/Ag$
   (b) $Pt/H_2(g)/HCl(sol.//AgNO_3(sol)/Ag$
   (c) $Pt/H_2(g)/HCl(sol.)//AgCl(s)/Ag$
   (d) $Pt/H_2(g)/KCl(sol.)//AgCl(s)/Ag$

3. The equation representing the process by which standard reduction potential of zinc can be defined is
   (a) $Zn^{2+}(s) + 2e^- \rightarrow Zn$
   (b) $Zn(g) \rightarrow Zn^{2+}(g) + 2e^-$
   (c) $Zn^{2+}(g) + 2e^- \rightarrow Zn$
   (d) $Zn^{2+}(aq.) + 2e^- \rightarrow Zn(s)$

4. Which of the following statement is wrong about galvanic cell?
   (a) cathode is positive charged
   (b) anode is negatively charged
   (c) reduction takes place at the anode
   (d) reduction takes place at the cathode

5. Which are used as secondary reference electrodes?
   (a) Calomel electrode
   (b) Ag/AgCl electrode
   (c) Hg/Hg_2Cl_2 – KCl electrode
   (d) All of the above

6. Strongest reducing agent is :
   (a) K (c) Al
   (b) Mg (d) I

7. Which of the following displacement does not occur?
   (a) $Zn + 2H^+ \rightarrow Zn^{2+} + H_2$
   (b) $Cu + Fe^{2+} \rightarrow Cu^{2+} + Fe$
   (c) $Fe + 2Ag^+ \rightarrow Fe^{2+} + Ag$
   (d) $Zn + Pb^{2+} \rightarrow Zn^{2+} + Pb$

8. The standard electrode potentials (reduction) of Pt/Fe^{3+}, Fe^{2+} and Pt/Sn^{4+}, Sn^{2+} are + 0.77 V and 0.15 V respectively at 25°C. The standard EMF of the reaction $Sn^{4+} + 2Fe^{2+}$ $Sn^{2+} + 2Fe^{3+}$ is
   (a) – 0.62 V (c) + 0.31 V
   (b) – 0.92 V (d) + 0.85 V

9. Adding powdered Pb and Fe to a solution containing 1.0 M is each of Pb^{2+} and Fe^{2+} ions would result into the formation of
   (E° Pb^{+2}/Pb = – 0.13V, E° Fe^{+2}/Fe = –0.44V)
   (a) More of Pb and Fe^{2+} ions
   (b) More of Fe and Pb
   (c) More of Fe and Pb^{2+} ions
   (d) More of Fe^{2+} and Pb^{2+} ions

10. Zn cannot displace following ions from their aqueous solution Except one.
    (a) Ag^+ (c) Fe^{2+}
    (b) Cu^{2+} (d) Na^+

11. **Assertion**: The cell potential of mercury cell is 1.35, which remains constant.
    Reason: In mercury cell, the electrolyte is a paste of KOH and ZnO.
    (a) Assertion is true but Reason is false.
    (b) Both Assertion and Reason are false.
    (c) Both Assertion and Reason are true and reason is correct explanation of the Assertion.
    (d) Both Assertion and Reason are true and reason is not the correct explanation of the Assertion.

12. The standard free energy change for the following reaction is – 210 kJ. What is the standard cell potential?
    $2H_2O_2(aq) \rightarrow H_2O(l) + O_2(g)$
    (a) + 0.752 (c) + 0.420
    (b) + 1.09 (d) + 0.640

13. The oxidation potential of Zn, Cu, Ag, H_2 and Ni are 0.76, –0.34, – 0.80, 0, 0.55 volt respectively. Which of the following reaction will provide maximum voltage?
(a) $Zn + Cu^{2+} \rightarrow Cu + Zn^{2+}$
(b) $H_2 + Cu^{2+} \rightarrow 2H^+ + Cu$
(c) $Zn + 2Ag^+ \rightarrow 2Ag + Zn^{2+}$
(d) $H_2 + Ni^{2+} \rightarrow 2H^+ + Ni$

14. The position of some metals in the electrochemical series in decreasing electropositive character is given as Mg > Al > Zn > Cu > Ag. What will happen if a copper spoon is used to stir a solution of aluminum nitrate?
(a) There is no reaction
(b) The spoon will get coated with aluminum
(c) An alloy of copper and aluminum is formed
(d) The solution becomes blue

15. The standard reduction electrode potential values of the element A, B and C are + 0.68, –2.50, and –0.50 V respectively. The order of their reducing power is :
(a) A > B > C (c) C > B > A
(b) A > C > B (d) B > C > A

16. A metal having negative reduction potential when dipped in the solution of its own ions, has a tendency
(a) to pass into the solution
(b) to be deposited from the solution
(c) to become electrically positive
(d) to remain neutral

17. E° for the half cell reactions are as,
(I) $Zn \rightarrow Zn^{2+} + 2e$; E° = + 0.76 V
(II) $Fe \rightarrow Fe^{2+} + 2e$; E° = + 0.41 V
The E° for half cell reaction, $Fe^{2+} + Zn \rightarrow Zn^{2+} + Fe$ is
(a) – 0.35 V (c) + 0.35 V
(b) + 1.17 V (d) – 0.17 V

18. Calculate the standard free energy change for the reaction,
$2 Ag + 2H^+ \rightarrow H^2 + 2 Ag^+$,
E° for $Ag^+ + e^- \rightarrow Ag$ is 0.80 V
(a) + 154.4 kJ (c) –154.4 kJ
(b) + 308 KJ (d) –308KJ.

19. An aqueous solution containing 1 M each of Au^{3+}, Cu^{2+}, Ag^+, Li^+ is being electrolysed by using inert electrodes. The value of standard potentials are $E^0_{Ag^+/Ag}$ = 0.80 V, $E^0_{Cu^{2+}/Cu}$ = 0.34 V and $E^0_{Au^{3+}/Au}$ = 1.50 V, with increasing voltage, the sequence of deposition of metals on the cathode will be :
(a) Li, Cu, Ag, Au (c) Au, Ag, Cu
(b) Cu, Ag, Au (d) Au, Ag, Cu, Li

20. The standard electrode potential for the reaction
$Ag^+ (aq) + e^- \rightarrow Ag(s)$
$Sn^{2+}(aq) + 2e^- \rightarrow Sn(s)$
at 25°C are 0.80 volt and – 0.14 volt, respectively. The emf of the cell.
Sn/Sn^{2+} (1 M)//Ag^+ (1M)/Ag is
(a) 0.66 volt (c) 1.08 volt
(b) 0.80 volt (d) 0.94 volt

21. The standard EMF of Daniel cell is 1.10 volt. The maximum electrical work obtained from the Daniel cell is
(a) 212.3 kJ (c) 106.15 kJ
(b) 175.4 KJ (d) 53.07KJ

22. Which cell convert electrical energy into chemical energy?
(a) Voltaic cell (c) Galvanic cell
(b) Electrolytic cell (d) Electrochemical

23. What is the free energy change for the half reaction $Li^+ + e^- \rightarrow Li$?
$E^0_{Li^+/Li}$=-3.0V, F=96500 C mol^{-1} and T=298 K.
(a) 289.5 kJ mol^{-1} (c) 32.166 CV^{-1} mol^{-1}
(b) –298.5 kJ mol^{-1} (d) –289500 CV mol^{-1}

24. The emf of Daniell cell is 1.1 volt. If the value of Faraday is 96500 coulombs per mole, the change in free energy in kJ is
(a) 212.30 (c) 106.15
(b) –212.30 (d) –106.15

25. The cell reaction of the galvanic cell
Cu(s) | Cu^{2+} (aq) || Hg^{2+} (aq) | Hg(l)
(a) $Hg + Cu^{2+} \rightarrow Hg^{2+} + Cu$
(b) $Hg + Cu^{2+} \rightarrow Cu^+ + Hg^+$
(c) $Cu + Hg \rightarrow CuHg$
(d) $Cu + Hg^{2+} \rightarrow Cu^{2+} + Hg$

26. Which one of the following metal is used in galvanization?
(a) Cu (c) Zn
(b) Ag (d) Fe

27. Galvanic cell is a device in which
(a) chemical energy is converted into electrical energy.
(b) electrical energy is converted into chemical energy.
(c) chemical energy is seen in the form of heat.
(d) thermal energy from an outside source is used to drive the cell reaction.

28. Anode in the galvanic cell, is
(a) negative electrode (c) neutral electrode
(b) positive electrode (d) None of these

29. In a hydrogen-oxygen fuel cell, combustion of hydrogen occurs to
(a) generate heat.
(b) produce high purity water.
(c) remove adsorbed oxygen from electrode surfaces.
(d) create potential difference between the two electrodes.

30. **Assertion**: Galvanized iron does not rust.
Reason: Zinc has a more negative electrode potential than iron
(a) Assertion is true but Reason is false.
(b) Both Assertion and Reason are false.
(c) Both Assertion and Reason are true and Reason is correct explanation of the Assertion.
(d) Both Assertion and Reason are true and Reason is not the correct explanation of the Assertion.

31. Galvanic cell is a device in which
(a) chemical energy is seen in the form of heat.
(b) electrical energy is converted into chemical energy.
(c) chemical energy is converted into electrical energy.
(d) thermal energy from an outside source is used to drive the cell reaction.

32. What is the cell reaction occurring in Daniell cell?
(a) $Cu(s) + ZnSO_4(aq) \rightarrow CuSO_4(aq) + Zn(s)$
(b) $Zn(s) + CuSO_4(aq) \rightarrow Cu(s) + ZnSO_4(aq)$
(c) $Ni(s) + ZnSO_4(aq) \rightarrow NiSO_4(aq) + Zn(s)$
(d) $2Na(s) + CdSO_4(aq) \rightarrow Na_2SO_4(aq) + Cd(s)$

33. When lead storage battery is charge
(a) lead dioxide dissolves.
(b) sulphuric acid is regenerated.
(c) the lead electrode becomes coated with lead sulphate.
(d) the amount of sulphuric acid decreases.

34. For cell reaction
$Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$, cell representation is
(a) $Zn/Zn^{2+}//Cu^{2+}/Cu$ (c) $Cu/Zn^{2+}//Zn/Cu^{2+}$
(b) $Cu/Cu^{2+}//Zn^{2+}/Zn$ (d) $Cu^{2+}/Zn//Zn^{2+}/Cu$

35. $E^o \frac{RT}{nF} \ln K_{eq,}$ this equation is called
(a) Gibbs equation
(b) Nernest equation
(c) Gibbs-Helmholtz equation
(d) Van der Waal's equation

36. Reduction potentials of A, B, C and D are 0.8 V, 0.79 V, 0.34 V and −2.37 V respectively. Which element displaces all the other three elements?
(a) B (c) A
(b) D (d) C

37. A solution of nickel sulphate in which nickel rod is dipped is diluted 10 times. The reduction potential of Ni at 298K
(a) decreases by 60mV (c) decrease by 30 mV
(b) decreases by 30 V (d) increases by 30 mV

38. $Cu^+(aq)$ is unstable in solution and undergoes simultaneous oxidation and reduction, according to the reaction $2Cu^+(aq) \rightleftharpoons Cu^{2+}(aq) + Cu(s)$ choose the correct E^o for the above reaction if $E^o_{Cu^{2+}/Cu} = 0.34$ V and $E^o_{Cu^{2+}/Cu^+} = 0.15$ V
(a) −0.38 V (c) +0.49V
(b) +0.38V (d) −0.19 V

39. When a lead storage battery is discharged
(a) $PbSO_4$ is formed (c) Pb is formed
(b) SO_2 is consumed (d) H_2SO_4 is formed

40. The equilibrium constant for the following redox reaction at 298 K of 1×10^{8}.
$2Fe^{2+}(aq) + 2I^{-}(aq) \rightleftharpoons 2Fe^{2+}(aq) + I_2(s)$
If the standard reduction potential of iodine becoming iodide is +0.54 V, what is the standard reduction potential of Fe^{3+}/Fe^{2+}?
(a) +1.006 V (c) –1.006 V
(b) +0.77 V (d) –0.77V

41. What is the electrode potential (in volt) of the following electrode at 25°C?
$Ni^{2+}(0.1\ M) \mid Ni(s)$
(Standard reduction potential of Ni^{2+}/Ni is –0.25 V, $\frac{2.303RT}{F}$ =0.06)
(a) –0.28V (c) –0.34 V
(b) –0.82 V (d) –0.22V

42. The standard reduction potentials for Cu^{2+}/Cu;
Zn^{2+}/Zn; Li^{+}/Li; Ag^{+}/Ag and H^{+}/H_2 are +0.34 V, –0.762 V, –3.05 V, +0.80 V and 0.00 V respectively. Choose the reducing agent among the following.
(a) Zn (c) H_2
(b) Ag (d) Li

43. At 25°C temperature, the cell potential of a given electrochemical cell is 1.92 V. Find the value of x.
$Mg(s)/Mg^{2+}(aq)$ x M $//Fe^{2+}(aq)$ 0.01M/Fe(s)
$E^{o}\ Mg/Mg^{2+}(aq)$ 2.37V; $E^{o}Fe/Fe^{2+}(aq)$ 0.45 V
(a) x=0.01M
(b) x<0.01 M
(c) x>0.01M
(d) x cannot be predicted

44. The hydrogen electrode is dipped in a solution of pH = 3 at 25°C. The potential of the cell would be
(the value of 2.303 RT/F is 0.059 V)
(a) 0.177 V (c) 0.087 V
(b) –0.177 V (d) 0.059V

45. The standard electrode potential for the reaction
$Ag^{+}(aq) + e^{-} \rightarrow Ag(s)$
$Sn^{2+}(aq) + 2e^{-} \rightarrow Sn(s)$
at 25°C are 0.80 volt and – 0.14 volt, respectively. The emf of the cell.
$Sn \mid Sn^{2+}(1\ M) \mid\mid Ag^{+}(1M) \mid Ag$ is
(a) 0.66 volt (c) 0.80 volt
(b) 1.08 volt (d) 0.94 volt

46. E° for the half cell reactions are as,
(a) $Zn = Zn^{2+} + 2e$; E° = + 0.76 V
(b) $Fe = Fe^{2+} + 2e$; E° = + 0.41 V
The E° for half cell reaction,
$Fe^{2+} + Zn \rightarrow Zn^{2+} + Fe$ is :
(a) – 0.35 V (c) + 0.35 V
(b) + 1.17 V (d) – 0.17 V

47. Calculate the standard free energy change for the reaction,
$2\ Ag + 2H^{+} \rightarrow H_2 + 2Ag^{+}$,
E° for $Ag+ + e^{-} \rightarrow Ag$ is 0.80 V
(a) + 154.4 kJ (c) + 308.8 kJ
(b) –154.4 kJ (d) –308.8 kJ

48. The standard electrode potentials (reduction) of Pt/Fe^{3+}, Fe^{2+} and Pt/Sn^{4+}, Sn^{2+} are +0.77 V and 0.15 V respectively at 25°C. The standard EMF of the reaction
$Sn^{4+} + 2Fe^{2+} \rightarrow Sn^{2+} + 2Fe^{3+}$ is
(a) – 0.62 V (c) – 0.92 V
(b) + 0.31 V (d) + 0.85 V

49. The chemical reaction,
$2AgCl(s)\ H_2(g) \rightarrow 2HCl(aq) + 2Ag(s)$
taking place in a galvanic cell is represented by the notation
(a) $Pt(s)/H_2(g)$,1bar/1M KCl(aq)/AgCl(s)/Ag(s)
(b) $Pt(s)/H_2(g)$,1bar/1M HCl(aq) /1MAg(aq)/Ag(s)
(c) $Pt(s)/H_2(g)$,1bar/1M HCl(aq)/ AgCl(s)/Ag(s)
(d) $Pt(s)/H_2$ (g),1bar /1M HCl(aq) /Ag(s)/AgCl(s)

50. Which of the following statements is true for the electrochemical Daniel cell?
(a) Electrons flow from copper electrode to zinc electrode
(b) Current flows from zinc electrode to copper electrode.
(c) Cations move toward copper electrode.
(b) Cations move toward zinc electrode.