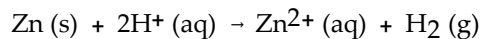


1082-3rd Chem Exam(A)-1090617

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) The standard cell potential (E°) of a voltaic cell constructed using the cell reaction below is 0.76 V:

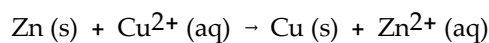


With $P_{\text{H}_2} = 1.0 \text{ atm}$ and $[\text{Zn}^{2+}] = 1.0 \text{ M}$, the cell potential is 0.53 V. The concentration of H^+ in the cathode compartment is _____ M.

- A) 1.7×10^{-8} B) 1.3×10^{-4} C) 1.1×10^{-2} D) 1.3×10^{-11} E) 7.7×10^3

Answer: B

- 2) The standard cell potential (E°_{cell}) for the reaction below is +1.10 V. The cell potential for this reaction is _____ V when the concentration of $[\text{Cu}^{2+}] = 1.0 \times 10^{-5} \text{ M}$ and $[\text{Zn}^{2+}] = 3.0 \text{ M}$.



- A) 1.26 B) 1.42 C) 0.94 D) 1.10 E) 0.78

Answer: C

Table 20.1

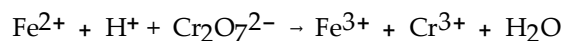
Half Reaction	$E^\circ(\text{V})$
$\text{F}_2 \text{ (g)} + 2\text{e}^- \rightarrow 2\text{F}^- \text{ (aq)}$	+2.87
$\text{Cl}_2 \text{ (g)} + 2\text{e}^- \rightarrow 2\text{Cl}^- \text{ (aq)}$	+1.359
$\text{Br}_2 \text{ (l)} + 2\text{e}^- \rightarrow 2\text{Br}^- \text{ (aq)}$	+1.065
$\text{O}_2 \text{ (g)} + 4\text{H}^+ \text{ (aq)} + 4\text{e}^- \rightarrow 2\text{H}_2\text{O (l)}$	+1.23
$\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag (s)}$	+0.799
$\text{Fe}^{3+} \text{ (aq)} + \text{e}^- \rightarrow \text{Fe}^{2+} \text{ (aq)}$	+0.771
$\text{I}_2 \text{ (s)} + 2\text{e}^- \rightarrow 2\text{I}^- \text{ (aq)}$	+0.536
$\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu (s)}$	+0.34
$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2 \text{ (g)}$	0
$\text{Pb}^{2+} + 2\text{e}^- \rightarrow \text{Pb (s)}$	-0.126
$\text{Ni}^{2+} + 2\text{e}^- \rightarrow \text{Ni (s)}$	-0.28
$\text{Li}^+ + \text{e}^- \rightarrow \text{Li (s)}$	-3.05

- 3) Which of the halogens in Table 20.1 is the strongest oxidizing agent?

- A) Br_2
 B) F_2
 C) I_2
 D) Cl_2
 E) All of the halogens have equal strength as oxidizing agents.

Answer: B

- 4) Which element is reduced in the reaction below?



- A) Fe B) O C) H D) Cr

Answer: D

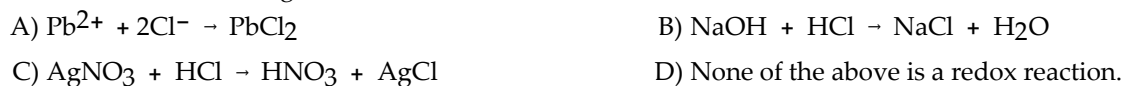
- 5) How many kilowatt-hours of electricity are used to produce 4.50 kg of magnesium in the electrolysis of molten MgCl_2 with an applied emf of 5.00 V? $1\text{V} = 1\text{ J/C}$; $1\text{ kWh} = 3.6 \times 10^6\text{ J}$
- A) 12.4 B) 0.0201 C) 24.8 D) 0.0496 E) 49.6

Answer: E

- 6) How many minutes will it take to plate out 16.22 g of Al metal from a solution of Al^{3+} using a current of 14.6 amps in an electrolytic cell?
- A) 66.2 B) 153 C) 11900 D) 53.0 E) 199

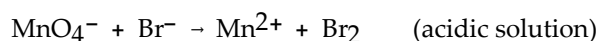
Answer: E

- 7) Which one of the following reactions is a redox reaction?



Answer: D

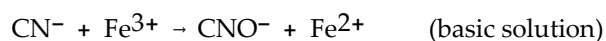
- 8) What is the coefficient of the permanganate ion when the following equation is balanced?



- A) 1 B) 3 C) 2 D) 4 E) 5

Answer: C

- 9) What is the coefficient of Fe^{3+} when the following equation is balanced?



- A) 1 B) 2 C) 3 D) 4 E) 5

Answer: B

- 10) Which transformation could take place at the anode of an electrochemical cell?

- A) HAsO_2 to As
B) O_2 to H_2O
C) F_2 to F^-
D) $\text{Cr}_2\text{O}_7^{2-}$ to Cr^{2+}
E) None of the above could take place at the anode.

Answer: E

- 11) What happens to the mass number and the atomic number of an element when it undergoes alpha decay?

- A) The mass number does not change and the atomic number increases by 2.
B) The mass number decreases by 4 and the atomic number decreases by 2.
C) The mass number increases by 4 and the atomic number does not change.
D) The mass number increases by 2 and the atomic number decreases by 1.
E) The mass number does not change and the atomic number increases by 1.

Answer: B

- 12) The mass of a proton is 1.00728 amu and that of a neutron is 1.00867 amu. What is the binding energy for per mole of Co-59 ? (The mass of a cobalt-59 nucleus is 58.9332 amu.)
- A) 1.34×10^{-34} J
 - B) 4.87×10^{13} J
 - C) 4.80×10^{10} J
 - D) 2.50×10^{12} J
 - E) 4.87×10^{10} J

Answer: B

- 13) The product of the nuclear reaction in which ^{40}Ar is subjected to neutron capture followed by alpha emission is _____.
- A) ^{35}Ar
 - B) ^{36}S
 - C) ^{45}Ca
 - D) ^{41}Ar
 - E) ^{37}S

Answer: E

- 14) Strontium-90 is a byproduct in nuclear reactors fueled by the radioisotope uranium-235. The half-life of strontium-90 is 28.8 yr. What percentage of a strontium-90 sample remains after 175.0 yr?
- A) 6.08
 - B) 84.8
 - C) 1.48
 - D) 0.230
 - E) 16.5

Answer: C

- 15) The half-life of cobalt-60 is 5.20 yr. How many milligrams of a 2.000-mg sample remain after 9.50 years?
- A) 0.565
 - B) 1.095
 - C) 7.03×10^{-22}
 - D) 1.435
 - E) 7.076

Answer: A

- 16) A rock contains 0.153 mg of lead-206 for each milligram of uranium-238. The half-life for the decay of uranium-238 to lead-206 is 4.5×10^9 yr. The rock was formed _____ years ago.
- A) 1.06×10^9
 - B) 7.33×10^8
 - C) 5.60×10^8
 - D) 8.08×10^8
 - E) 6.89×10^8

Answer: A

- 17) In the nuclear transmutation represented by $^{16}_8\text{O}(p, \alpha) ^{13}_7\text{N}$, the emitted particle is _____.
- A) a neutron.
 - B) an alpha particle.
 - C) a positron.
 - D) a beta particle.
 - E) a proton.

Answer: B

- 18) What happens to the mass number and the atomic number of an element when it emits gamma radiation?
- A) The mass number decreases by four and the atomic number decreases by two.
 - B) The mass number increases by four and the atomic number increases by two.
 - C) The mass number remains unchanged while the atomic number increases by one.
 - D) The mass number remains unchanged while the atomic number decreases by one.
 - E) The mass number and atomic numbers remain unchanged.

Answer: E

19) Carbon-11 decays by _____.

- A) alpha emission
- B) positron emission
- C) beta emission
- D) neutron capture
- E) photon emission

Answer: B

20) Cobalt-60 is produced by a three reaction process involving neutron capture, beta-emission, and neutron capture. The initial reactant in the production of cobalt-60 is _____.

- A) ^{60}Fe
- B) ^{59}Co
- C) ^{58}Fe
- D) ^{61}Co
- E) ^{56}Fe

Answer: C

21) Which one of the following is the correct formula for pentaamminechlorocobalt (III) chloride?

- A) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$
- B) $[\text{Cl}(\text{NH}_3)_5\text{Co}]\text{Co}_2$
- C) $[\text{Co}(\text{NH}_3)_5]\text{Cl}_4$
- D) $[\text{Co}(\text{NH}_3)_4\text{Cl}]\text{Cl}_2$
- E) $[\text{Co}(\text{NH}_3)_6\text{Cl}]\text{Cl}_2$

Answer: A

22) Based on electron configuration, which is most likely colorless?

- A) $[\text{Cr}(\text{NH}_3)_5\text{Cl}]^{2+}$
- B) $[\text{Cd}(\text{NH}_3)_4]^{2+}$
- C) $[\text{Co}(\text{NH}_3)_6]^{2+}$
- D) $[\text{Cu}(\text{NH}_3)_4]^{2+}$
- E) $[\text{Ni}(\text{NH}_3)_6]^{2+}$

Answer: B

23) Which element has the largest bonding atomic radius?

- A) scandium
- B) manganese
- C) chromium
- D) titanium
- E) vanadium

Answer: A

24) Which ion shown has empty 5s orbitals?

- A) Mo^{2+}
- B) Y^{3+}
- C) Nb^{2+}
- D) Zr^{4+}
- E) All choices have empty 5s orbitals.

Answer: E

25) Which of the following is not a chelating agent?

- A) ethylenediamine
- B) ortho-phenanthroline
- C) carbonate ion
- D) triphosphate ion
- E) water

Answer: E

26) A substance with unpaired electrons will be _____.

- A) permanently magnetic
- B) slightly attracted to a magnet
- C) nonmetallic
- D) slightly repelled by a magnet
- E) brightly colored

Answer: B

27) Which of the following will display optical isomerism?

- A) octahedral $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$
- B) square-planar $[\text{Rh}(\text{CO})_2\text{Cl}_2]^-$
- C) octahedral $[\text{Co}(\text{H}_2\text{NC}_2\text{H}_4\text{NH}_2)_3]^{3+}$
- D) square-planar $[\text{Pt}(\text{H}_2\text{NC}_2\text{H}_4\text{NH}_2)_2]^{2+}$
- E) octahedral $[\text{Co}(\text{NH}_3)_6]^{3+}$

Answer: C

28) How many d electrons are associated with the metal ion in $[\text{Cr}(\text{NH}_3)_6]^{3+}$?

- A) 0
- B) 4
- C) 1
- D) 3
- E) 2

Answer: D

29) What two oxidation states are more frequently observed in the first transition series than in the third?

- A) +5 and +6
- B) +3 and +7
- C) +3 and +5
- D) +2 and +3
- E) +2 and +7

Answer: D

30) A complex that absorbs light at 700 nm will appear _____.

- A) yellow
- B) violet
- C) green
- D) red
- E) orange

Answer: C

31) Which one of the following could be a straight-chain alkane?

- A) C_9H_{20}
- B) C_3H_3
- C) C_4H_6
- D) C_3H_6
- E) C_5H_4

Answer: A

32) Which of the following compounds does not contain a C=O bond?

- A) aldehydes
- B) carboxylic acids
- C) esters
- D) alcohols
- E) none of the above

Answer: D

33) How many chiral centers are there in $\text{CH}_3\text{CHCHCH}_2\text{CHBr}_2$?

- A) 3
- B) 4
- C) 1
- D) 2
- E) 0

Answer: E

34) Hybridization of the carbon atom indicated by (*) in $\text{CH}_3\text{-}^*\text{CH}_2\text{-CH}_3$, $^*\text{CH}_2=\text{CH}_2$, and $\text{CH}_3\text{-}^*\text{C}\equiv\text{CH}$ is _____, _____, and _____, respectively.

- A) sp^2 , sp^3 , sp
- B) sp^3 , sp , sp^2
- C) sp , sp^3 , sp^2
- D) sp , sp^2 , sp^3
- E) sp^3 , sp^2 , sp

Answer: E

35) How many structural isomers of heptane exist?

- A) 4
- B) 9
- C) 2
- D) 8
- E) 6

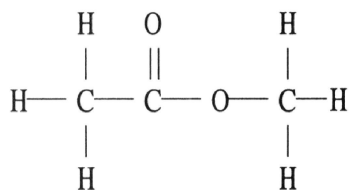
Answer: B

36) In general, _____ are the most reactive hydrocarbons.

- A) olefins
- B) alkenes
- C) alkynes
- D) alkanes
- E) cycloalkanes

Answer: C

37) The compound below is a(n) _____.



- A) ester
- B) carboxylic acid
- C) amine
- D) ketone
- E) aldehyde

Answer: A

38) The melting and boiling points of hydrocarbons are determined by _____.

- A) ionic bonding
- B) dipole-dipole attraction
- C) ion-dipole attraction
- D) hydrogen bonding
- E) London forces

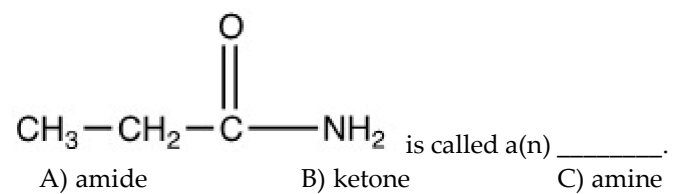
Answer: E

39) Ethers can be made by condensation of two _____ molecules by splitting out a molecule of water.

- A) alcohol
- B) ketone
- C) alkyne
- D) olefin
- E) aldehyde

Answer: A

40)



A) amide

B) ketone

C) amine

D) aldehyde

E) ester

Answer: A