

1052-3rd Chem Exam-1060621 (A)

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

1) How many isomers are possible for C₅H₁₂?

A) 1

B) 2

C) 10

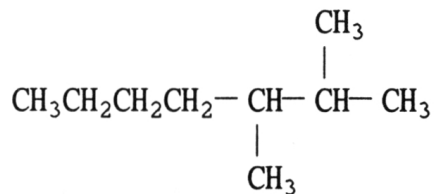
D) 4

E) 3

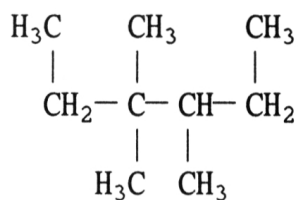
Answer: E

2) The structure of 2,3-dimethylheptane is _____.

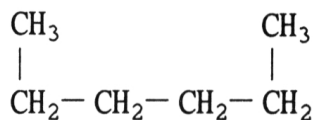
A)



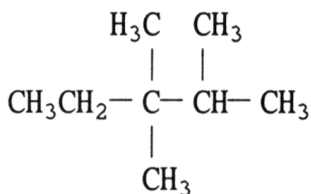
B)



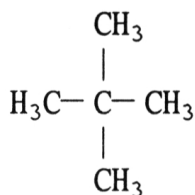
C)



D)



E)



Answer: A

3) Which statement about hydrocarbons is false?

A) Cyclic alkanes are structural isomers of alkenes.

B) Alkenes can be polymerized.

C) Alkanes can be produced by hydrogenating alkenes.

D) Alkanes are more reactive than alkenes.

E) The smallest alkane to have structural (constitutional) isomers has 4 carbon atoms.

Answer: D

4) The oxidation of ethanol produces _____.

A) oxalic acid

B) citric acid

C) lactic acid

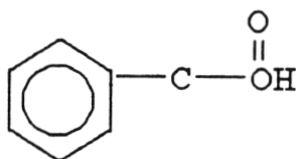
D) formic acid

E) acetic acid

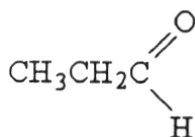
Answer: E

5) Which structure below represents a ketone?

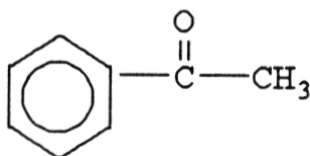
A)



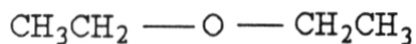
B)



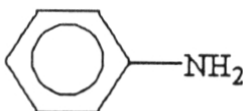
C)



D)



E)



Answer: C

6) How many chiral centers are there in $\text{CH}_3\text{CHClCH}_2\text{CH}_2\text{CHBrCH}_3$?

A) 3

B) 0

C) 4

D) 2

E) 1

Answer: D

7) Proteins are biopolymers formed via multiple condensation coupling of which two functional groups?

A) alcohol and carboxylic acid

B) ester and amine

C) ester and carboxylic acid

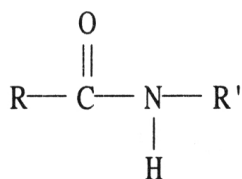
D) amine and carboxylic acid

E) alcohol and amine

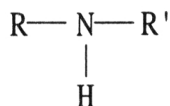
Answer: D

8) Which of the following contains a peptide linkage?

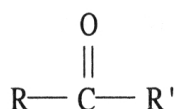
A)



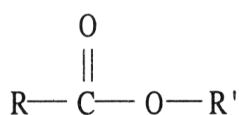
B)



C)



D)



E) none of the above

Answer: A

9) The principal difference between fructose and glucose is that _____.

- A) glucose is chiral and fructose is not
- B) fructose is a monosaccharide and glucose is a disaccharide
- C) fructose is a ketone sugar and glucose is an aldehyde sugar
- D) fructose is chiral and glucose is not
- E) fructose is a disaccharide and glucose is a monosaccharide

Answer: C

10) The double helix of DNA is stabilized mainly by _____.

- A) ionic bonds
- B) covalent bonds
- C) hydrogen bonds
- D) ion-dipole bonds
- E) ester bonds

Answer: C

11) In what type of radioactive decay does the atomic number of the product increase by one?

- A) positron emission
- B) electron capture
- C) gamma
- D) beta
- E) alpha

Answer: D

12) Atoms with the same atomic number and different mass numbers _____.

- A) are isotopes
- B) do not exist
- C) are allotropes
- D) are resonance structures
- E) are isomers

Answer: A

13) At approximately what number of protons, or neutrons, does the 1:1 ratio of protons to neutrons start to produce unstable nuclei?

- A) 10
- B) 20
- C) 50
- D) 30
- E) 80

Answer: B

14) 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) ^{59}Co
- B) ^{58}Fe
- C) ^{61}Co
- D) ^{60}Fe
- E) ^{56}Fe

Answer: B

15) What is emitted in the nuclear transmutation, $^{27}_{13}\text{Al}(n, ?)^{24}_{11}\text{Na}$?

- A) a neutron
- B) an alpha particle
- C) a proton
- D) a beta particle
- E) a gamma photon

Answer: B

16) Which one of the following can be done to shorten the half-life of the radioactive decay of uranium-238?

- A) heat it
- B) oxidize it to the +2 oxidation state
- C) convert it to UF_6
- D) freeze it
- E) none of the above

Answer: E

17) The beta decay of cesium-137 has a half-life of 30.0 years. How many years must pass to reduce a 25 mg sample of cesium 137 to 8.7 mg?

- A) 46
- B) 32
- C) 52
- D) 50
- E) 3.2

Answer: A

18) Cesium-137 undergoes beta decay and has a half-life of 30.0 years. How many beta particles are emitted by a 14.0-g sample of cesium-137 in three minutes?

- A) 6.1×10^{13}
- B) 8.4×10^{15}
- C) 1.3×10^{-8}
- D) 6.2×10^{22}
- E) 8.1×10^{15}

Answer: E

19) The mass of a proton is 1.00728 amu and that of a neutron is 1.00867 amu. What is the binding energy per nucleon (in J) of a ${}_{27}^{60}\text{Co}$ nucleus? (The mass of a cobalt-60 nucleus is 59.9338 amu.)

- A) 9.43×10^{-13} B) 2.49×10^{-12} C) 7.01×10^{-14} D) 1.37×10^{-12} E) 3.04×10^{-12}

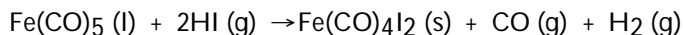
Answer: D

20) Which one of the following forms of radiation can penetrate the deepest into body tissue?

- A) proton B) beta C) positron D) alpha E) gamma

Answer: E

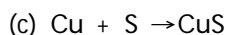
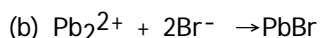
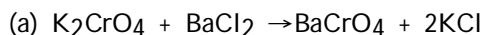
21) Which element is reduced in the reaction below?



- A) O B) Fe C) C D) H E) I

Answer: D

22) Which of the following reactions is a redox reaction?



- A) (a) only B) (b) only C) (c) only D) (a) and (c) E) (b) and (c)

Answer: C

23) The purpose of the salt bridge in an electrochemical cell is to _____.

- A) maintain electrical neutrality in the half-cells via migration of ions
B) provide a means for electrons to travel from the cathode to the anode
C) provide oxygen to facilitate oxidation at the anode
D) provide a means for electrons to travel from the anode to the cathode
E) provide a source of ions to react at the anode and cathode

Answer: A

24) Which one of the following types of elements is most likely to be a good oxidizing agent?

- A) halogens
B) alkaline earth elements
C) lanthanides
D) alkali metals
E) transition elements

Answer: A

Table 20.2

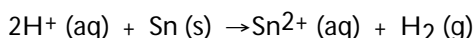
Half-reaction	E° (V)
$\text{Cr}^{3+}(\text{aq}) + 3\text{e}^- \rightarrow \text{Cr}(\text{s})$	-0.74
$\text{Fe}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Fe}(\text{s})$	-0.440
$\text{Fe}^{3+}(\text{aq}) + \text{e}^- \rightarrow \text{Fe}^{2+}(\text{s})$	+0.771
$\text{Sn}^{4+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Sn}^{2+}(\text{aq})$	+0.154

25) Which of the following reactions will occur spontaneously as written?

- A) $\text{Sn}^{4+}(\text{aq}) + \text{Fe}^{3+}(\text{aq}) \rightarrow \text{Sn}^{2+}(\text{aq}) + \text{Fe}^{2+}(\text{aq})$
- B) $\text{Sn}^{4+}(\text{aq}) + \text{Fe}^{2+}(\text{aq}) \rightarrow \text{Sn}^{2+}(\text{aq}) + \text{Fe}(\text{s})$
- C) $3\text{Fe}(\text{s}) + 2\text{Cr}^{3+}(\text{aq}) \rightarrow 2\text{Cr}(\text{s}) + 3\text{Fe}^{2+}(\text{aq})$
- D) $3\text{Sn}^{4+}(\text{aq}) + 2\text{Cr}(\text{s}) \rightarrow 2\text{Cr}^{3+}(\text{aq}) + 3\text{Sn}^{2+}(\text{aq})$
- E) $3\text{Fe}^{2+}(\text{aq}) \rightarrow \text{Fe}(\text{s}) + 2\text{Fe}^{3+}(\text{aq})$

Answer: D

26) Consider an electrochemical cell based on the reaction:

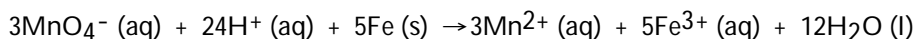


Which of the following actions would not change the measured cell potential?

- A) addition of more tin metal to the anode compartment
- B) increasing the tin (II) ion concentration in the anode compartment
- C) lowering the pH in the cathode compartment
- D) increasing the pressure of hydrogen gas in the cathode compartment
- E) Any of the above will change the measured cell potential.

Answer: A

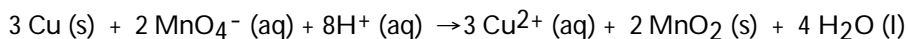
27) The half-reaction occurring at the anode in the balanced reaction shown below is _____.



- A) $\text{Fe}^{2+}(\text{aq}) \rightarrow \text{Fe}^{3+}(\text{aq}) + \text{e}^-$
- B) $2\text{MnO}_4^-(\text{aq}) + 12\text{H}^+(\text{aq}) + 6\text{e}^- \rightarrow 2\text{Mn}^{2+}(\text{aq}) + 3\text{H}_2\text{O}(\text{l})$
- C) $\text{MnO}_4^-(\text{aq}) + 8\text{H}^+(\text{aq}) + 5\text{e}^- \rightarrow \text{Mn}^{2+}(\text{aq}) + 4\text{H}_2\text{O}(\text{l})$
- D) $\text{Fe}(\text{s}) \rightarrow \text{Fe}^{2+}(\text{aq}) + 2\text{e}^-$
- E) $\text{Fe}(\text{s}) \rightarrow \text{Fe}^{3+}(\text{aq}) + 3\text{e}^-$

Answer: E

28) The standard cell potential (E°_{cell}) of the reaction below is +1.34 V. The value of ΔG° for the reaction is _____ kJ/mol.



- A) -24.3
- B) -776
- C) +776
- D) +259
- E) -259

Answer: B

- 29) Galvanized iron is iron coated with _____.
A) magnesium B) phosphate C) iron oxide D) zinc E) chromium
Answer: D
- 30) How many minutes will it take to plate out 4.56 g of Ni metal from a solution of Ni^{2+} using a current of 50.5 amps in an electrolytic cell?
A) 4.95 B) 148 C) 297 D) 2.47 E) 4.55
Answer: A
- 31) Chalcocite, chalcopyrite, and malachite are sources of which metal?
A) manganese B) titanium C) zinc D) iron E) copper
Answer: E
- 32) What two oxidation states are more frequently observed in the first transition series than in the third?
A) +3 and +7 B) +5 and +6 C) +2 and +7 D) +3 and +5 E) +2 and +3
Answer: E
- 33) Which one of the following is not true about transition metals?
A) They typically have low melting points.
B) Their compounds frequently exhibit magnetic properties.
C) They are found in the d-block of the periodic table.
D) Their compounds are frequently colored.
E) They frequently have more than one common oxidation state.
Answer: A
- 34) What is the oxidation number of Ni in $[\text{Ni}(\text{CN})_5]^{3-}$?
A) 1+ B) 2+ C) 3+ D) 4+ E) 5+
Answer: B
- 35) Changes in the coordination sphere of a complex compound may lead to changes in _____.
A) color
B) stability
C) chemical properties
D) physical properties
E) all of the above
Answer: E
- 36) What is the purpose of adding EDTA to prepared foods?
A) to keep ions such as Ca^{2+} in solution so the foods look good
B) to complex trace metal ions that catalyze decomposition reactions
C) to aid in browning of the surface during cooking
D) to complex iron (III) ions so they can catalyze protein decomposition on cooking
E) to prevent dissolution of the container in the food when stored for long periods of time
Answer: B

- 37) A complex of correctly written formula $[\text{Pt}(\text{NH}_3)_3\text{Br}]\text{Br} \cdot \text{H}_2\text{O}$ has which set of ligands in its inner coordination sphere?
- A) 3 NH_3 and 1 Br^-
 - B) 3 NH_3 and 2 Br^-
 - C) 3 NH_3 , 2 Br^- , and 1 H_2O
 - D) 3 NH_3 , 1 Br^- , and 1 H_2O
 - E) 3 NH_3

Answer: A

- 38) Does either or both cis- or trans- $[\text{Mn}(\text{en})_2\text{Br}_2]$ have optical isomers?
- A) trans only
 - B) cis only
 - C) both cis and trans
 - D) neither cis nor trans
 - E) $[\text{Mn}(\text{en})_2\text{Br}_2]$ does not exhibit cis-trans isomerism.

Answer: B

- 39) Based on electron configuration, which is most likely colorless?
- A) $[\text{Cr}(\text{NH}_3)_5\text{Cl}]^{2+}$
 - B) $[\text{Cu}(\text{NH}_3)_4]^{2+}$
 - C) $[\text{Co}(\text{NH}_3)_6]^{2+}$
 - D) $[\text{Ni}(\text{NH}_3)_6]^{2+}$
 - E) $[\text{Cd}(\text{NH}_3)_4]^{2+}$

Answer: E

- 40) Which one of the following complex ions will be paramagnetic?
- A) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ (low spin)
 - B) $[\text{Zn}(\text{H}_2\text{O})_4]^{2+}$
 - C) $[\text{Zn}(\text{NH}_3)_4]^{2+}$
 - D) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ (low spin)
 - E) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ (low spin)

Answer: D