1042_3rd Exam_1050622(A)

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

1) For the galvanic cell reaction, expressed below using shorthand notation, what half-reaction occurs at the cathode?

$Zn(s) \mid Zn^{2+}(aq) \parallel Ni^{2+}(aq) \mid Ni(s)$

A) $Zn^{2+}(aq) + 2\,e^- \rightarrow Zn(s)$
B) $Ni(s) \rightarrow Ni^{2+}(aq) + 2\,e^-$
C) $Zn(s) \rightarrow Zn^{2+}(aq) + 2\,e^-$
D) $Ni^{2+}(aq) + 2\,e^- \rightarrow Ni(s)$

Answer: D

2) Identify the characteristics of a spontaneous reaction.

A) $\Delta E°_{cell} > 0$
B) $K > 1$
C) $\Delta G° < 0$
D) all of the above
E) none of the above

Answer: D

3) Which of the following is the strongest oxidizing agent?

A) Fe(s) B) $ClO_2(g)$ C) $H_2O_2(aq)$ D) $I_2(s)$ E) $Fe^{3+}(aq)$

Answer: C

4) The electrolysis of molten $AlCl_3$ for 3.25 hr with an electrical current of 15.0 A produces _____ g of aluminum metal.

A) 147 B) 49.1 C) 4.55×10^{-3} D) 16.4 E) 0.606

Answer: D

5) How many kilowatt-hours of electricity are used to produce 3.00 kg of magnesium in the electrolysis of molten $MgCl_2$ with an applied emf of 4.50 V?

A) 0.0336 B) 14.9 C) 0.0298 D) 7.4 E) 29.8

Answer: E

6) Describe the reactions during the electrolysis of water.

A) Oxygen and hydrogen are both reduced.
B) Oxygen gas is produced at the cathode, whereas hydrogen gas is found at the anode.
C) Oxygen is oxidized and hydrogen is reduced.
D) Oxygen and hydrogen are both oxidized.
E) Oxygen is reduced and hydrogen is oxidized.

Answer: C

7) What element is being oxidized in the following redox reaction?

$$C_3H_8O_2(aq) + KMnO_4(aq) \rightarrow C_3H_2O_4K_2(aq) + MnO_2(aq)$$

A) H B) K C) O D) C E) Mn

Answer: D

8) Which of the following is the weakest reducing agent?

A) K(s) B) $Cr^{3+}(aq)$ C) $F^-(aq)$ D) $Ca^{2+}(aq)$ E) Cr(s)

Answer: C

9) Predict the species that will be reduced first if the following mixture of molten salts undergoes electrolysis.

Zn^{2+}, Fe^{3+}, Mg^{2+}, Br^-, I^-

A) Fe^{3+} B) Zn^{2+} C) Br^- D) I^- E) Mg^{2+}

Answer: A

10) Use the standard half-cell potentials listed below to calculate the standard cell potential for the following reaction occurring in an electrochemical cell at 25°C. (The equation is balanced.)

$3\ Cl_2(g) + 2\ Fe(s) \rightarrow 6\ Cl^-(aq) + 2\ Fe^{3+}(aq)$

$Cl_2(g) + 2\ e^- \rightarrow 2\ Cl^-(aq)$ E° = +1.36 V

$Fe^{3+}(aq) + 3\ e^- \rightarrow Fe(s)$ E° = -0.04 V

A) +1.32 V B) -1.32 V C) +1.40 V D) -1.40 V E) +4.16 V

Answer: C

11) Determine the cell notation for the redox reaction given below.

$3\ Cl_2(g) + 2\ Fe(s) \rightarrow 6\ Cl^-(aq) + 2\ Fe^{3+}(aq)$

A) $Fe(s) \mid Fe^{3+}(aq) \parallel Cl_2(g) \mid Cl^-(aq) \mid Pt$

B) $Cl_2(g) \mid Cl^-(aq) \mid Pt \parallel Fe(s) \mid Fe^{3+}(aq)$

C) $Cl^-(aq) \mid Cl_2(g) \mid Pt \parallel Fe^{3+}(aq) \mid Fe(s)$

D) $Fe(s) \mid Cl_2(g) \parallel Fe^{3+}(aq) \mid Cl^-(aq) \mid Pt$

E) $Fe^{3+}(aq) \mid Fe(s) \parallel Cl^-(aq) \mid Cl_2(g) \mid Pt$

Answer: A

12) Balance the following redox reaction if it occurs in basic solution. What are the coefficients in front of Br_2 and OH^- in the balanced reaction?

$Br_2(l) \rightarrow BrO_3^-(aq) + Br^-(aq)$

A) $Br_2 = 3$, $OH^- = 6$

B) $Br_2 = 2$, $OH^- = 5$

C) $Br_2 = 1$, $OH^- = 6$

D) $Br_2 = 1$, $OH^- = 2$

E) $Br_2 = 3$, $OH^- = 3$

Answer: A

13) What is the reducing agent in the redox reaction represented by the following cell notation?

$Ca(s) \mid Ca^{2+}(aq) \parallel Ag^+(aq) \mid Ag(s)$

A) Ca(s) B) $Ag^+(aq)$ C) Ag(s) D) Pt E) $Ca^{2+}(aq)$

Answer: A

14) What is the reducing agent in the redox reaction represented by the following cell notation?

$$Zn(s) \mid Zn^{2+}(aq) \parallel Ag^{+}(aq) \mid Ag(s)$$

A) Ag(s) B) Pt C) $Zn^{2+}(aq)$ D) $Ag^{+}(aq)$ E) Zn(s)

Answer: E

15) What is the oxidizing agent in the redox reaction represented by the following cell notation?

$$Ni(s) \mid Ni^{2+}(aq) \parallel Ag^{+}(aq) \mid Ag(s)$$

A) Pt B) $Ni^{2+}(aq)$ C) Ag(s) D) $Ag^{+}(aq)$ E) Ni(s)

Answer: D

16) Determine the redox reaction represented by the following cell notation.

$$Fe(s) \mid Fe^{2+}(aq) \parallel Cu^{2+}(aq) \mid Cu(s)$$

A) $2\ Cu(s) + Fe^{2+}(aq) \rightarrow Fe(s) + 2\ Cu^{2+}(aq)$

B) $2\ Fe(s) + Cu^{2+}(aq) \rightarrow Cu(s) + 2\ Fe^{2+}(aq)$

C) $3\ Fe(s) + 2\ Cu^{2+}(aq) \rightarrow 2\ Cu(s) + 3\ Fe^{2+}(aq)$

D) $Cu(s) + Fe^{2+}(aq) \rightarrow Fe(s) + Cu^{2+}(aq)$

E) $Fe(s) + Cu^{2+}(aq) \rightarrow Cu(s) + Fe^{2+}(aq)$

Answer: E

17) What is undergoing reduction in the redox reaction represented by the following cell notation?

$$Pb(s) \mid Pb^{2+}(aq) \parallel H^{+}(aq) \mid H_2(g) \mid Pt$$

A) $Pb^{2+}(aq)$ B) $H_2(g)$ C) $H^{+}(aq)$ D) Pt E) Pb(s)

Answer: C

18) Determine the identity of the daughter nuclide from the beta decay of $^{99}_{43}Tc$.

A) $^{103}_{45}Rh$ B) $^{99}_{44}Ru$ C) $^{95}_{41}Nb$ D) $^{100}_{44}Ru$ E) $^{99}_{42}Mo$

Answer: B

19) Determine the binding energy of an O-16 nucleus. The O-16 nucleus has a mass of 15.9905 amu. A proton has a mass of 1.00728 amu, a neutron has a mass of 1.008665 amu, and 1 amu is equivalent to 931 MeV of energy.

A) 138 MeV B) 78.1 MeV C) 128 MeV D) 38.2 MeV E) 8.84 MeV

Answer: C

20) Identify the missing particle in the following nuclear equation:

$$^{214}_{82}\text{Pb} \rightarrow {}^{0}_{-1}\text{e} + ?$$

A) $^{214}_{81}\text{Tl}$ B) $^{214}_{83}\text{Bi}$ C) $^{213}_{82}\text{Pb}$ D) $^{215}_{81}\text{Tl}$ E) $^{215}_{82}\text{Pb}$

Answer: B

21) Determine the identity of the daughter nuclide from the electron capture by $^{55}_{26}\text{Fe}$.

A) $^{55}_{25}\text{Mn}$ B) $^{55}_{27}\text{Co}$ C) $^{56}_{27}\text{Co}$ D) $^{51}_{24}\text{Cr}$ E) $^{54}_{25}\text{Mn}$

Answer: A

22) Write a nuclear equation for the alpha decay of $^{238}_{92}\text{U}$.

A) $^{238}_{92}\text{U} \rightarrow {}^{0}_{-1}\text{e} + {}^{238}_{93}\text{Np}$

B) $^{238}_{92}\text{U} \rightarrow {}^{4}_{2}\text{He} + {}^{234}_{90}\text{Th}$

C) $^{238}_{92}\text{U} \rightarrow {}^{0}_{-1}\text{e} + {}^{238}_{91}\text{Pa}$

D) $^{238}_{92}\text{U} \rightarrow {}^{1}_{0}\text{n} + {}^{237}_{92}\text{U}$

E) $^{238}_{92}\text{U} \rightarrow {}^{0}_{+1}\text{e} + {}^{238}_{91}\text{Pa}$

Answer: B

23) Determine the identity of the daughter nuclide from the positron emission of $^{11}_{6}\text{C}$.

A) $^{10}_{5}\text{B}$ B) $^{11}_{5}\text{B}$ C) $^{12}_{6}\text{C}$ D) $^{12}_{7}\text{N}$ E) $^{11}_{7}\text{N}$

Answer: B

24) Identify the nuclide that has the shortest half-life.

A) $^{14}_{6}\text{C}$ B) $^{220}_{86}\text{Rn}$ C) $^{219}_{90}\text{Th}$ D) $^{235}_{92}\text{U}$ E) $^{232}_{90}\text{Th}$

Answer: B

25) Describe what changes occur during alpha decay.

A) The mass number and atomic number increases.
B) The mass number increases and the atomic number decreases.
C) The mass number and atomic number decreases.
D) The mass number is unchanged and the atomic number increases.
E) The mass number and atomic number do not change.

Answer: C

26) In addition to a beta particle, what is the other product of beta decay of $^{214}_{82}Pb$?

A) $^{218}_{84}Po$ B) $^{214}_{81}Tl$ C) $^{200}_{80}Hg$ D) $^{214}_{83}Bi$

Answer: D

27) Determine the half-life of a nuclide that loses 38.0% of its mass in 407 hours.

A) 568 hour B) 586 hours C) 204 hours D) 291 hours E) 281 hours

Answer: B

28) If we start with 1.000 g of cobalt-60, 0.675 g will remain after 3.00 yr. This means that the half-life of cobalt-60 is _____ yr.

A) 2.03 B) 3.08 C) 7.65 D) 4.44 E) 5.30

Answer: E

29) Complete the following equation of nuclear fusion.

$$^{2}_{1}H + {}^{3}_{1}H \rightarrow {}^{4}_{2}He + \_\_\_\_\_$$

A) $^{0}_{-1}n$ B) $^{0}_{0}\gamma$ C) $^{0}_{+1}H$ D) $^{1}_{0}n$ E) $^{1}_{1}H$

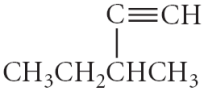
Answer: D

30) Identify the symptom that is not from radiation exposure.

A) increased cancer risk
B) death
C) measles
D) weaker immune systems
E) genetic effects

Answer: C

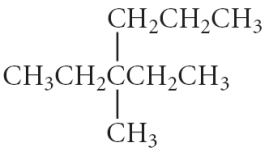
31) Name the following compound.



A) 2-ethynebutane
B) 3-ethyl-1-butyne
C) 1-hexyne
D) 3-methyl-4-pentyne
E) 3-methyl-1-pentyne

Answer: E

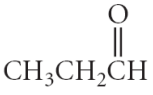
32) Name the following compound.

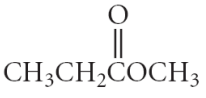


A) 3-methyl-3-propylpentane
B) 3-ethyl-3-propylbutane
C) 2-ethylheptane
D) nonane
E) 3-ethyl-3-methylhexane

Answer: E

33) Arrange the following in order from least oxidized to most oxidized.

I. 

II. 

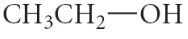
III. 

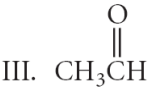
A) I < III < II B) II < I < III C) III < I < II D) I < II < III E) III < I = II

Answer: C

34) Arrange the following in order from most oxidized to least oxidized.

I. 

II. 

III. 

A) II > I > III B) III > I > III C) I > II > III D) III > II > I E) II > I > III

Answer: D

35) Molecules with the same formula but different structures are called _____.
A) structural isomers
B) enantiomers
C) achiral
D) racemic mixture
E) diastereomers

Answer: A

36) Write a balanced chemical reaction to represent the combustion of 2,2-dimethylpropane.

A) $2\ C_3H_8 + O_2 \rightarrow 3\ CH_4 + 2\ H_2O$

B) $C_5H_{12} + 8\ O_2 \rightarrow 5\ CO_2 + 6\ H_2O$

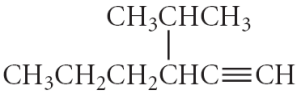
C) $C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$

D) $C_5H_{12} + H_2 \rightarrow CH_4 + 2\ C_2H_6$

E) $C_3H_8 + H_2 \rightarrow CH_4 + C_2H_6$

Answer: B

37) Name the following compound.



A) 1-nonyne

B) 3-isopropyl-1-hexyne

C) 2-methyl-4-pentyne

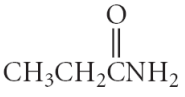
D) 4-methyl-3-propyl-1-pentyne

E) 4-propyl-5-hexyne

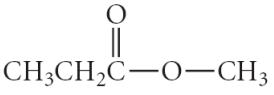
Answer: B

38) Which of the following compounds is an ether?

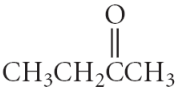
A)



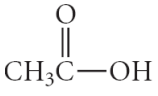
B)



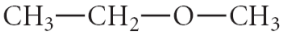
C)



D)

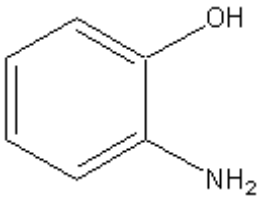


E)



Answer: E

39) Name the following compound.



A) 2-aminophenol
B) 2-aminoaniline
C) 2-hydroxybenzaldehyde
D) 2-methylphenol
E) 2-aminobenzoic acid

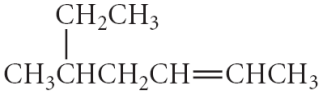
Answer: A

40) How many isomers are there for C_5H_{12} ?

A) 6 B) 4 C) 3 D) 5

Answer: C

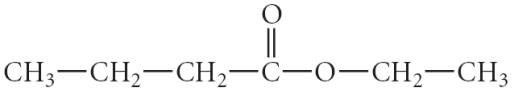
41) Name the following compound.



A) 4-isobutyl-2-butene
B) 4-isopropyl-2-butene
C) 2-ethyl-4-hexane
D) 3-methyl-5-hexane
E) 5-methyl-2-heptene

Answer: E

42) Name the following compound.



A) propyl propanoate
B) 4-hexanone
C) ethyl butyl ether
D) ethyl butanoate
E) hexanoic acid

Answer: D

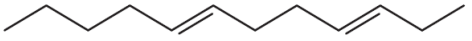
43) Choose the weak base from the compounds below.

A) CH_3CH_3 B) CH_3SCH_3 C) CH_3COOH D) CH_3CH_2I E) $(CH_3)_2NH$

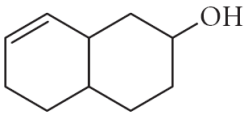
Answer: E

44) Choose the polyunsaturated fatty acid from the compounds below.

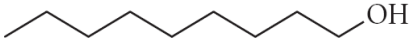
A)



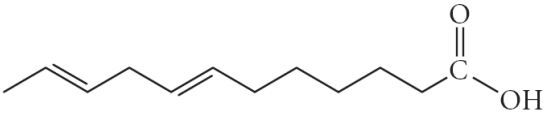
B)



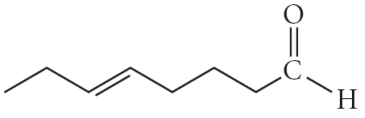
C)



D)



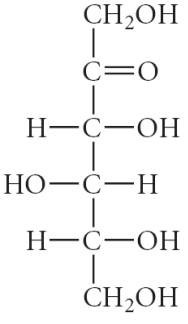
E)



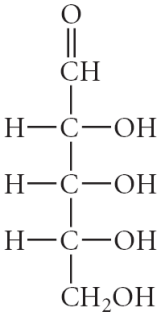
Answer: D

45) Which of the following is an example of a ketopentose?

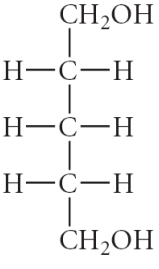
A)



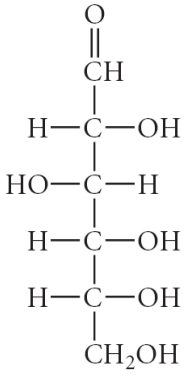
B)



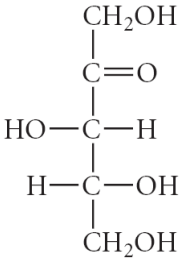
C)



D)



E)



Answer: E

46) Identify the smallest amino acid.
A) glycine
B) tyrosine
C) cysteine
D) phenylalanine
E) aspartic acid

Answer: A

47) The following is part of a DNA sequence. What is its complementary sequence?

AGTTCGAGCCT

A) AGGCTCGAACT
B) TCCGAGCTTGA
C) CAGTCCA
D) TCAAGCTCGGA
E) AGTTCGAGCCT

Answer: D

48) Which of the following is a type of nucleic acid?
A) carbohydrate
B) amino acid
C) DNA
D) dipeptide
E) lipid

Answer: C

49) Which of the following link together amino acid units?

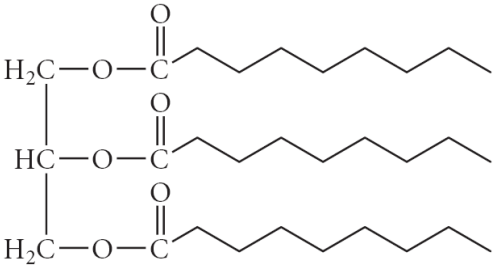
A) hydrogen bonds
B) sulfide linkages
C) glycosidic linkages
D) ester linkages
E) peptide bonds

Answer: E

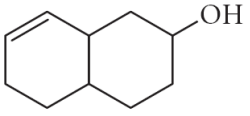
50) Choose the polyunsaturated triglyceride from the compounds below.

A)

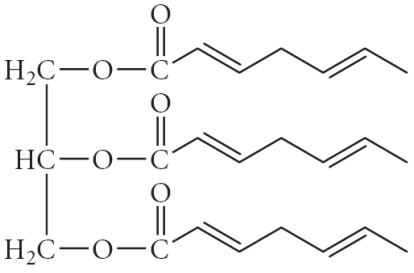
B)



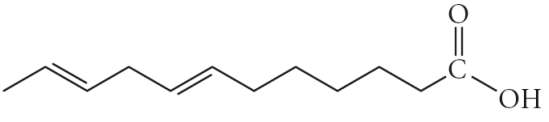
C)



D)



E)



Answer: D