1022_4th Exam_1030618(A)

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

1) What is between the two strands of DNA, holding them together?
   A) ionic bonds
   B) hydrogen bonds
   C) dipole-dipole bonds
   D) covalent bonds
   E) London dispersion forces

   Answer: B

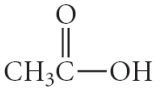
2) Identify the common radiotracers used in the diagnosis of medical problems
   A) iron-59
   B) thallium-201
   C) iodine-131
   D) fluorine-18
   E) all of the above

   Answer: E

3) Identify the sugar in DNA.
   A) galactose B) fructose C) deoxyribose D) glucose E) ribose

   Answer: C

4) Which of the following compounds is an ester?
   A)



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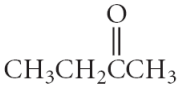

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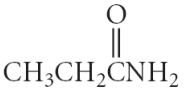
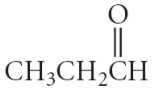
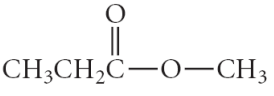


   D)

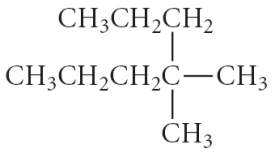


   E)



   Answer: E

5) Name the following compound.



A) 4-propyl-4-methylpentane
B) 4,4-dimethylheptane
C) 4-methyl-4-propylpentane
D) 2-methyl-2-propylpentane
E) nonane

Answer: B

6) Give the product for the dehydration of $CH_3CH_2CH_2OH$.

A) $CH_3CH{=}CH_2$
B) $CH_3CH{=}CHCH_3$
C) $CH_3CH_2CH_2OCH_2CH_2CH_3$
D) $CH_2{=}C{=}CH_2$
E) $CH_3CH_2CH{=}CH_2$

Answer: A

7) Which of the following statements is TRUE?

A) Beta decay occurs when a neutron changes into a proton while emitting an electron.
B) An alpha particle is a helium 2+ ion.
C) Positrons are similar in ionizing power and penetrating power to beta particles.
D) A positron is the antiparticle of the electron.
E) All of the above are true.

Answer: E

8) Determine the identity of the daughter nuclide from the alpha decay of $^{224}_{88}Ra$.

A) $^{225}_{89}Ac$ B) $^{223}_{87}Fr$ C) $^{228}_{90}Th$ D) $^{220}_{86}Rn$ E) $^{222}_{84}Po$

Answer: D

9) Which of the following compounds exhibits optical isomerism?

A) $CH_3\text{-}CH_2\text{-}CH_2F$
B) $CH_3\text{-}CH_2\text{-}CH_3$
C) $CH_3\text{-}CH_2\text{-}CBr_2\text{-}CH_3$
D) $CH_3\text{-}CHBr\text{-}CH_3$
E) $CH_3\text{-}CH_2\text{-}CHF\text{-}CH_3$

Answer: E

10) Complete and balance the following addition reaction.

$CH_3C{\equiv}CCH_3 + 2\ Cl_2 \rightarrow\ ?$

A) $CH_3C{\equiv}CCH_3 + 2\ Cl_2 \rightarrow\ 4\ CH_3Cl$
B) $CH_3C{\equiv}CCH_3 + 2\ Cl_2 \rightarrow\ CH_3CCl_2CCl_2CH_3$
C) $CH_3C{\equiv}CCH_3 + Cl_2 \rightarrow\ CH_3CHClCHClCH_3$
D) $CH_3C{\equiv}CCH_3 + 4\ Cl_2 \rightarrow\ 4\ CH_2Cl_2$
E) $CH_3C{\equiv}CCH_3 + 3\ Cl_2 \rightarrow 2\ CH_3CCl_3$

Answer: B

11) Which of the following describes a primary protein structure?
A) arrangement of multiple protein subunits
B) protein structure maintained by disulfide linkages
C) protein chains maintained by interactions of peptide backbones
D) amino acid sequence maintained by peptide bonds
E) protein structure maintained through multiple hydrogen bonds

Answer: D

12) Which of the following statements is TRUE?
A) If N/Z ratio is too high, there are too many protons and the nuclide will undergo positron emission or electron capture.
B) If N/Z ratio is too low, there are too many neutrons and the nuclide will undergo beta decay.
C) If N/Z ratio lies somewhere below 1, the nuclide is stable.
D) The valley of stability is the geographic location where many of the known nuclides were first discovered.
E) None of the above are true.

Answer: E

13) Determine the binding energy per nucleon of an Mg-24 nucleus. The Mg-24 nucleus has a mass of 23.98504. 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) 0.113 MeV B) 106 MeV C) 0.3050 MeV D) 8.00 MeV E) 4.43 MeV

Answer: D

14) Which of the following compounds exhibit geometric isomerism?
A) $CH_2{=}CCl_2$
B) $CH_2{=}CH_2$
C) $CBr_2{=}CHBr$
D) $(CH_3)_2C{=}CH\text{-}CH_3$
E) $CHCl{=}CHCl$

Answer: E

15) The age of an ancient tree trunk is estimated using radiocarbon dating. If the trunk has a C-14 decay rate that is 34% of what it is in living plants, how old is the trunk? The half-life of C-14 is 5730 years.

A) 1.94×10^4 years
B) 8.92×10^3 years
C) 5.31×10^3 years
D) 1.74×10^2 years
E) 2.92×10^4 years

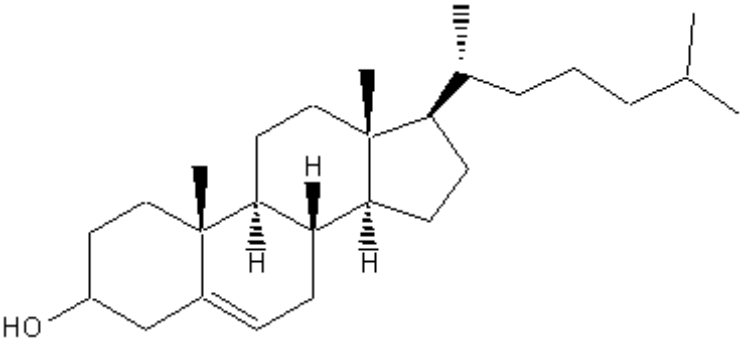
Answer: B

16) Which of the following nuclides are most likely to decay via beta decay?

A) Na-20 B) Al-24 C) N-13 D) I-126 E) Cs-137

Answer: E

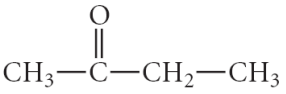
17) What type of lipid is the following compound?



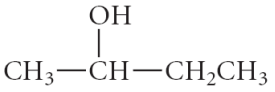
A) glycolipid
B) fatty acid
C) steroid
D) triglyceride
E) phospholipid

Answer: C

18) Determine the product(s) of the reduction of the following compound:



A)



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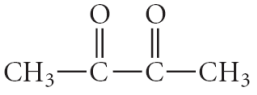

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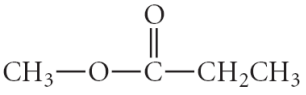

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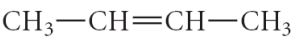

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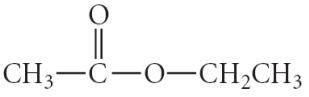


Answer: A

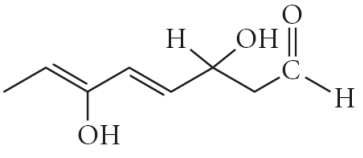
19) Identify the lowest natural radiation.

A) terrestrial radiation
B) radon gas
C) cosmic radiation from outer space
D) natural radionuclides in the body
E) a five-hour jet airplane ride

Answer: E

20) Choose the monosaccharide from the compounds below.

A)



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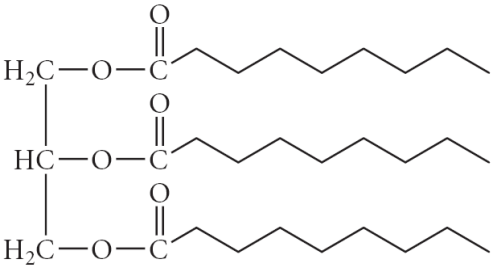

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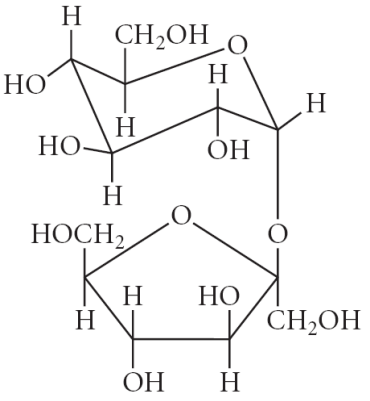

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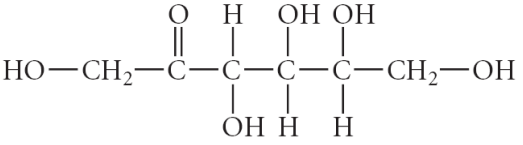

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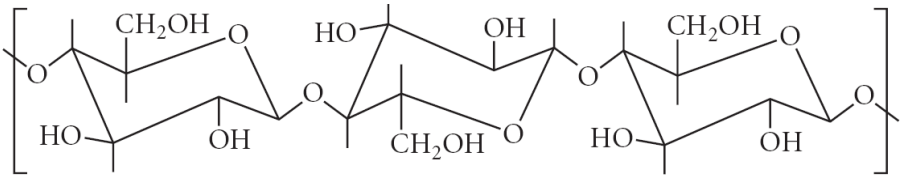
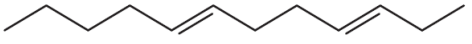


Answer: D

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

A)



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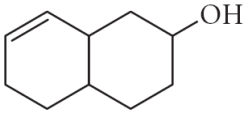

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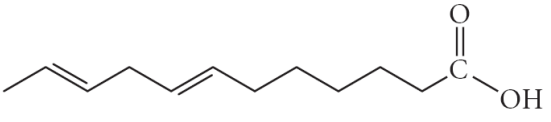

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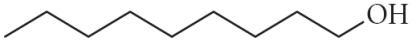

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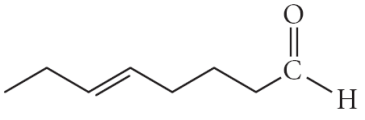


Answer: C

22) Calculate the mass defect in Fe-56 if the mass of an Fe-56 nucleus is 55.921 amu. The mass of a proton is 1.00728 amu and the mass of a neutron is 1.008665 amu.

A) 0.564 amu B) 0.528 amu C) 0.079 amu D) 1.056 amu E) 3.507 amu

Answer: B

23) Identify an alpha particle.

A) $^{1}_{0}n$ B) $^{0}_{-1}e$ C) $^{4}_{2}He$ D) $^{0}_{+1}e$ E) $^{0}_{0}\gamma$

Answer: C

24) Which of the following statements is TRUE?

A) A chromosome is a structure within a cell nucleus that houses DNA.
B) Every nucleotide in DNA has the same sugar, but each nucleotide has just one of four different bases.
C) A codon is a sequence of 3 bases that codes for a single amino acid.
D) A nucleotide is composed of a sugar, a base and a phosphate group.
E) All of the above are true.

Answer: E

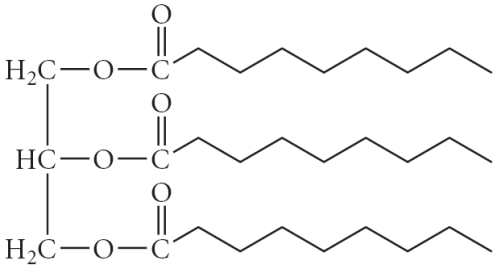
25) Identify the formula for an alkene.

A) C_nH_{2n+2} B) C_nH_{2n-4} C) C_nH_{2n+4} D) C_nH_{2n-2} E) C_nH_{2n}

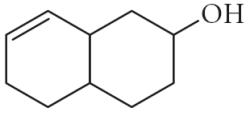
Answer: E

26) Choose the saturated triglyceride from the compounds below.

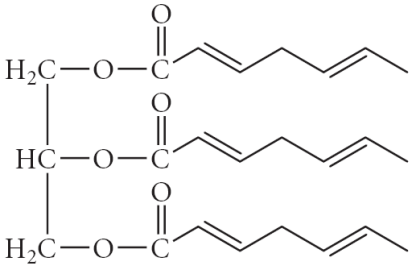
A)



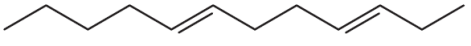
B)



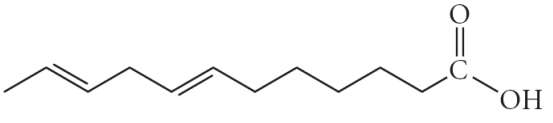
C)



D)

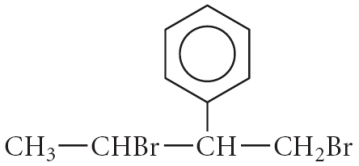


E)



Answer: A

27) How many of the carbons in the following compound are chiral center(s)?



A) 2 B) 1 C) 4 or more D) 3 E) 0

Answer: A

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

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

Answer: E

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

I. CH_3CH_3

II. $CH_3CH_2—OH$

III. $CH_3\overset{\overset{O}{\|}}{C}H$

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

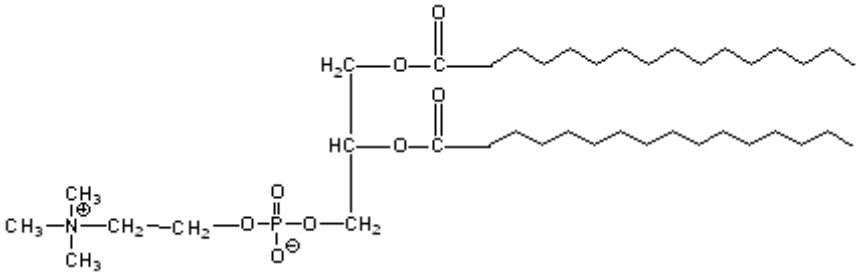
Answer: E

30) Molecules with the same formula but different structures are called _____.

A) achiral
B) enantiomers
C) diastereomers
D) structural isomers
E) racemic mixture

Answer: D

31) What type of lipid is the following compound?



A) steroid
B) glycolipid
C) phospholipid
D) fatty acid
E) triglyceride

Answer: C

32) Nonsuperimposable mirror images are called _____.
A) racemic mixture
B) diastereomers
C) achiral
D) structural isomers
E) enantiomers

Answer: E

33) Determine the products of the following reaction:

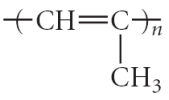
$$\text{Benzene} + CH_3CH_2Cl \xrightarrow{AlCl_3} \ ?$$

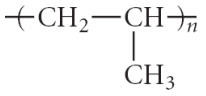
A) 1,4-diethylbenzene and Cl_2
B) trichlorobenzene and CH_3CH_3
C) 1,2-dimethylbenzene and Cl_2
D) ethylbenzene and HCl
E) dichlorobenzene and CH_3CH_2Cl

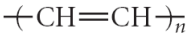
Answer: D

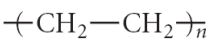
34) Which of the following represent the addition polymer formed from the compound below?

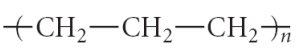
$CH_2=CH-CH_3$

A)


B)


C)


D)


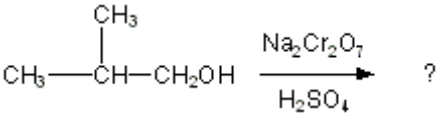
E)


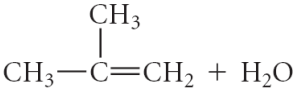
Answer: B

35) Type I diabetes develops when the pancreas does not make enough _____.
A) insulin B) sucrose C) iron D) blood E) cholesterol

Answer: A

36) Determine the products of the following reaction:



A)


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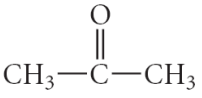

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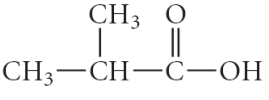
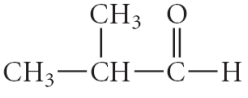
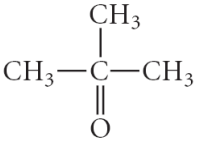


D)


E)


Answer: C

37) Identify the instrument(s) used to detect radiation.

A) Geiger-Muller counter
B) scintillation counter
C) film-badge dosimeter
D) all of the above
E) none of the above

Answer: D

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

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

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

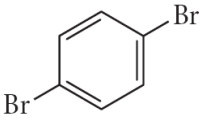
C) $^{238}_{92}U \rightarrow {}^{0}_{-1}e + {}^{238}_{91}Pa$

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

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

Answer: D

39) Name the following compound.



A) p-bromobenzene
B) m-dibromobenzene
C) o-dibromobenzene
D) p-dibromobenzene
E) none of the above

Answer: D

40) Which of the following compounds is an aldehyde?

A) CH_3-O-CH_3
B) $CH_3CH_2CH{=}O$
C) $CH_3CH_2CH_2CO_2H$
D) $CH_3CO_2CH_3$
E) CH_2OH-CH_2OH

Answer: B