

1002_4th Exam_1010620

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

1) Choose the INCORRECT statement.

- A) Isoelectric point is the pH at which an amino acid becomes a cation.
- B) Dipolar ions are also called zwitterion.
- C) Two amino acids joined by the elimination of a water molecule is a dipeptide.
- D) Amino acids can exist as dipolar ions.

Answer: A

2) The half-life of ^{238}U , which decomposes to ^{206}Pb , is 4.51×10^9 y. A rock contains equal masses of these two isotopes. How old is this rock?

- A) 9.02×10^9 y
- B) 4.51×10^9 y
- C) 4.06×10^9 y
- D) 5.00×10^9 y

Answer: D

3) What total energy is released when 0.75 grams of ^{235}U undergo fission if each atom averages 3.2×10^{-11} J of energy released?

- A) 6.15×10^{10} J
- B) 1.45×10^{10} J
- C) 1.45×10^{13} J
- D) 6.15×10^7 J

Answer: A

4) Which class of compounds is the least reactive?

- A) ketones
- B) alkyl halides
- C) alcohols
- D) ethers

Answer: D

5) The initial decay rate of a nuclide is $1.77 \times 10^{12}/\text{m}$. After 7.63 d, the decay rate is $1.82 \times 10^{11}/\text{m}$. What is the half-life of the isotope?

- A) 2.32 d
- B) 0.298 d
- C) 2.50 d
- D) 139 d

Answer: A

6) Which of the following nuclear species would require the least amount of kinetic energy to penetrate the nucleus of a lead (Pb) atom?

- A) ^3_2He
- B) ^1_0n
- C) ^4_2He
- D) ^2_1H

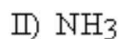
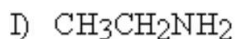
Answer: B

7) If an ethyl group is substituted for one hydrogen of cyclohexane, what would be the preferred position of that ethyl substituent on the ring?

- A) equatorial position
- B) boat position
- C) chair position
- D) axial position

Answer: A

8) Choose the right order of increasing basicity of the following compounds.



A) $\text{II} < \text{I} < \text{III}$

B) $\text{II} < \text{III} < \text{I}$

C) $\text{III} < \text{II} < \text{I}$

D) $\text{I} < \text{II} < \text{III}$

Answer: C

9) Which of the following are true for alpha particles?

- I) α particles are equivalent to $2\frac{1}{1}\text{p} + 2\frac{1}{0}\text{n}$.
- II) α decay decreases the atomic number by four.
- III) α particles are deflected more strongly than e^- by magnetic fields, but in the opposite direction.
- IV) α particles are easily stopped as they strike matter.

A) I and II

B) I, II, III, and IV

C) I, II, III

D) I and IV

Answer: D

10) Choose the INCORRECT statement.

- A) Radioactivity is the emission of ionizing radiation.
- B) A beta particle is a neutron.
- C) Gamma rays are emitted from a nucleus in an excited state.
- D) An alpha particle is the nucleus of a helium-4 atom.

Answer: B

11) Which of the following has the highest boiling point: butane, propane, hexane?

- A) hexane
- C) butane

B) propane

D) All have the same boiling point.

Answer: A

12) How many skeletal isomers for C_6H_{14} can be drawn?

A) 8

B) 3

C) 5

D) 6

Answer: C

13) To produce an ether from methanol, one uses:

- A) heat
- C) Cu, heat

B) concentrated H_2SO_4

D) KOH in alcohol

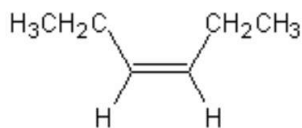
Answer: B

14) Choose the INCORRECT statement.

- A) The absolute configuration is the arrangement of atoms as determined by x-ray studies.
- B) A chiral atom is said to be unsymmetric.
- C) Molecules that are optically active isomers but not mirror images are diastereomers.
- D) Enantiomer properties differ only in the direction they rotate plane polarized light.

Answer: A

15) What is the complete systematic name for the following molecule?



A) *cis*-3-hexyne

B) *trans*-3-hexene

C) 3-hexene

D) *cis*-3-hexene

Answer: D

- 16) Saponification of 1 mole of glyceryl dibutyrooleate with excess potassium hydroxide would yield which of the following products?
- A) 2 moles of potassium butyrate
 - B) 2 moles of potassium butyrate, 1 mole of potassium oleate
 - C) 1 mole of glycerol, 1 mole of potassium decanoate, 2 moles of potassium butyrate
 - D) 1 mole of glycerol, 1 mole of potassium oleate, 2 moles of potassium butyrate
- Answer: D
- 17) Nuclear binding energy is:
- I) the energy liberated from the mass which is "lost" when forming a nucleus
 - II) related to "lost" mass by the relationship $1 \text{ amu} = 28.4 \text{ MeV}$
 - III) related to "lost" mass by the relationship $1 \text{ amu} = 931.5 \text{ MeV}$
 - IV) the force which holds the 3 atomic particles together
- A) III and IV B) I and II C) I and III D) I, III, and IV
- Answer: C
- 18) Predict the isoelectric point for tyrosine, $4\text{-OHC}_6\text{H}_4\text{CH}_2\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$, given $\text{pK}_{\text{a}1} = 2.2$ and $\text{pK}_{\text{a}2} = 9.1$.
- A) 5.7 B) 11.3 C) 7.0 D) 6.9
- Answer: A
- 19) Which enzyme does NOT break down the listed compounds?
- A) trypsin and chymotrypsin - polypeptides
 - B) amylases - starch
 - C) pepsin - diglycerides
 - D) lipase - fats and oils
- Answer: C
- 20) An alcohol of formula $\text{C}_3\text{H}_8\text{O}$ in which there are only three different kinds of hydrogens is:
- A) 1-propanol B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ C) 2-propanol D) cyclopropanol
- Answer: C
- 21) In the reaction $^{12}_6\text{C} + ^4_2\text{He} \rightarrow ^{16}_8\text{O}$ how much energy is produced per gram of carbon used? Masses, in unified atomic mass units are: $^{12}_6\text{C} = 12.00000$, $^4_2\text{He} = 4.00260$, $^{16}_8\text{O} = 15.99491$.
- Express your answer in Joules/gram of carbon.
- A) 2.10×10^{19} B) 2.33×10^{10} C) 3.36×10^{15} D) 7.77×10^4
- Answer: B
- 22) Approximately what mass of a 1.00-mg sample of ^{131}I remains after 40.2 days? The half-life of ^{131}I is 8.04 d.
- A) 0.0156 mg B) 0.200 mg C) 0.0313 mg D) 0.0249 mg
- Answer: C
- 23) Which of the following readily dissolve in nonpolar solvents?
- A) lipids
 - B) enzymes
 - C) nucleic acids
 - D) proteins
- Answer: A

24) All of the following contribute to the tertiary structure of proteins except

- A) salt linkages. B) peptide bonds.
C) disulfide linkages. D) hydrogen bonding.

Answer: B

25) Choose the INCORRECT statement.

- A) Conformers are arrangements of cyclohexanes which can change from one to the other, boat and chair.
B) Cyclic alkanes are called chiral.



- C) $-\text{C}-$ is a carbonyl group
D) Equatorial H extend outward from the cyclohexane ring.

Answer: B

26) A newly synthesized element is found to have a half-life of 3.82 minutes. How long after its formation will the activity be only 10% of original activity?

- A) 0.603 min B) 6.03 min C) 12.7 min D) 1.27 min

Answer: C

27) 2-methyl-2-butene + HBr $\rightarrow$

- A) $(\text{CH}_3)_2\text{CHCHBrCH}_3$ B) $(\text{CH}_3)_2\text{CBrCH}_2\text{CH}_3$
C) $(\text{CH}_3)_2\text{CBrCH}=\text{CH}_2$ D) no reaction

Answer: B

28) The charcoal from ashes found in a cave gave 3.34 ^{14}C counts per gram per minute. Wood from the outer portion of a growing tree gives a comparable count of 16.0. The half-life of ^{14}C is 5700 years. How old are the ashes?

- A) 8.93×10^3 yr B) 1.93×10^4 yr C) 1.29×10^4 yr D) 6.87×10^3 yr

Answer: C

29) 2-butanol could be made in one step from each of the following reactants EXCEPT:

- A) $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$ B) $\text{CH}_3\text{CHClCH}_2\text{CH}_3$
C) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$ D) $\text{CH}_3\text{CH}=\text{CHCH}_2$

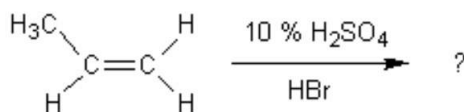
Answer: C

30) Which of the following nuclear changes does NOT represent alpha particle emission?

- A) $^{238}_{92}\text{U} \rightarrow ^{237}_{89}\text{Ac}$ B) $^{218}_{84}\text{Po} \rightarrow ^{214}_{82}\text{Pb}$ C) $^{222}_{86}\text{Rn} \rightarrow ^{218}_{84}\text{Po}$ D) $^{248}_{36}\text{Cm} \rightarrow ^{214}_{82}\text{Pb}$

Answer: A

31) What is the main product of the following reaction?



- A) 1-bromo-2-methylethane B) 2-bromopropene
C) 2-bromopropane D) 1-bromopropane

Answer: C

32) Radioactive decay is

- A) a second-order process.
C) a zero-order process.

- B) a process with a large activation energy.
D) temperature independent.

Answer: D

33) A certain radioactive series starts with $^{235}_{92}\text{U}$ and ends with $^{207}_{82}\text{Pb}$. In the overall process, _____ alpha particles and _____ beta particles are emitted.

A) 7, 10

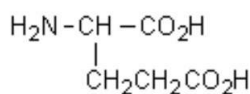
B) 7, 4

C) 8, 6

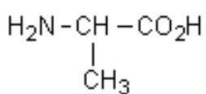
D) 14, 10

Answer: B

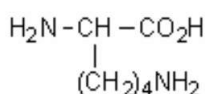
34) A mixture of the three amino acids shown below was buffered to pH 7.0 and placed in the center of an electric field with the cathode to the left and the anode to the right. From left to right, what would be the positional order of the amino acids after sufficient time to allow migration?



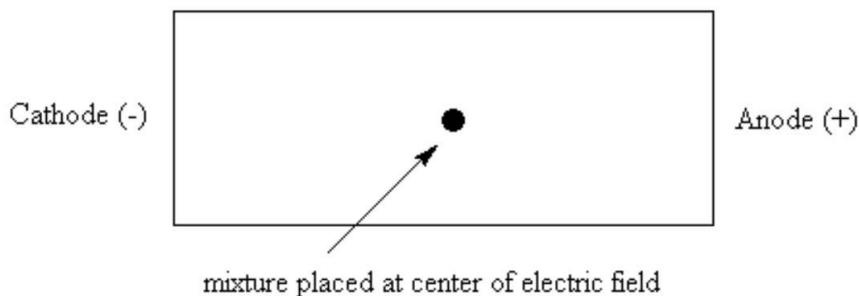
A



B



C



A) B, C, A

B) A, B, C

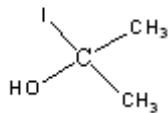
C) C, B, A

D) B, A, C

Answer: C

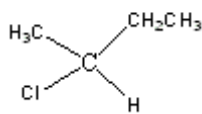
35) Which of the following compounds is(are) chiral?

I.



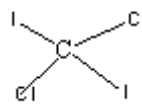
A) I

II.



B) II

III.



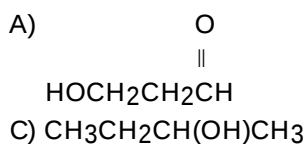
C) III

D) I + II

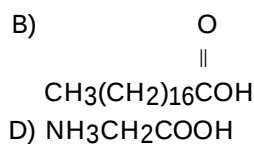
Answer: B

36) Choose the molecule which may display optical isomerism.

A)



B)



Answer: C

37) Choose the condensed structural formula for 3-bromopentane.

- A) $(\text{CH}_3)_3\text{CHBrCH}_2\text{CH}_3$ B) $\text{CH}_3\text{CH}_2\text{CBr}_3\text{CH}_2\text{CH}_3$
C) $\text{CH}_3\text{CH}_2\text{CHBrCH}_2\text{CH}_2\text{CH}_3$ D) $\text{CH}_3\text{CH}_2\text{CHBrCH}_2\text{CH}_3$

Answer: D

38) Choose the INCORRECT statement.

- A) The usual form for DNA is a double helix.
B) Nucleic acids are made up of heterocyclic amines, a 5-carbon sugar and phosphate groups.
C) Genes are portions of the chromosome that carry specific traits.
D) The bases in the two chains of the double helix are randomly paired.

Answer: D

39) Choose the INCORRECT completion. By careful inspection of the formula of lactic acid, $\text{CH}_3\text{CHOHCOOH}$, one would predict:

- A) cis and trans isomerism
B) two forms of the acid, showing a mirror image relationship
C) optical isomerism
D) the presence of a chiral carbon atom

Answer: A

40) Which of the following statements concerning alpha decay is INCORRECT?

- A) It has great penetrating power, but little ionizing power.
B) The alpha particle is two protons and two neutrons.
C) It often leaves the nucleus in an excited state.
D) It involves nuclides with atomic number larger than 83 and mass number larger than 200.

Answer: A

41) A nuclide has a decay constant of $4.28 \times 10^{-4}/\text{h}$. If the activity of a sample is $3.14 \times 10^5/\text{s}$, how many atoms of the nuclide are present in the sample?

- A) 2.34×10^{11} B) 7.34×10^8 C) 1.34×10^2 D) 2.64×10^{12}

Answer: D

42) Enantiomers ALWAYS

- A) have an asymmetric carbon B) rotate polarized light
C) have different physical properties D) change the color of light

Answer: B

43) Compounds which are optical isomers of one another but differ in physical and chemical properties are known as what?

- A) diastereomers B) geometric isomers
C) enantiomers D) racemic compounds

Answer: A

44) How many tripeptides can be formed from serine, alanine, and glycine?

- A) 10 B) 8 C) 4 D) 6

Answer: D

45) Which of the following types of nuclear decay result in a decrease in nuclear charge?

- I) alpha emission
- II) beta emission
- III) positron emission
- IV) electron-capture

A) III and IV

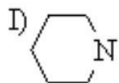
B) I and III

C) II and IV

D) IV only

Answer: A

46) Which of the following is the most soluble in water?



III) NH_3

IV) $\text{CH}_3(\text{CH}_2)_4\text{NH}_2$



V) $\text{CH}_3\text{CH}_2\text{NHCH}_2\text{CH}_3$

A) I

B) II

C) III

D) IV

Answer: C

47) Which class of compounds is most oxidized?

A) acids

B) aldehydes

C) ketones

D) alcohols

Answer: A

48) A compound of formula $\text{C}_4\text{H}_8\text{O}$ could be any of the following EXCEPT a(n):

A) carboxylic acid

B) ether

C) aldehyde

D) alcohol

Answer: A

49) Half-life is:

- I) the time for a sample to decay completely.
- II) constant for a given radioisotope.
- III) the time required for half of a sample to decay.
- IV) inversely proportional to the decay constant.

A) I and II

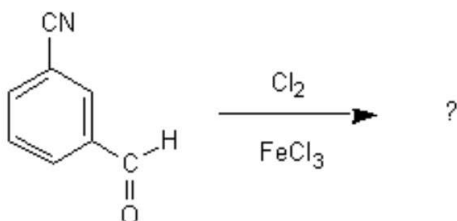
B) II, III, and IV

C) I and III

D) I, III, and IV

Answer: B

50) What is(are) the main product(s) of the following chlorination reaction?



A) 2-chloro-3-cyanobenzaldehyde

B) 2-chloro-3-cyanobenzaldehyde and 2-chloro-5-cyanobenzaldehyde

C) 3-chloro-5-cyanobenzaldehyde

D) 2, 6-dichloro-3-cyanobenzaldehyde

Answer: C