1. A monomer is
A. a polymer made from only one component.
B. a single polymer chain.
C. a polymer molecule that only contains a single element.
D. a small molecule used to make a polymer chain.

2. Whenever a substance is oxidized,
A. it is called the oxidizing agent.
B. hydronium ions are produced.
C. it gains electrons.
D. some other substance must be reduced.

3. The "Big Six" polymers are all classified as thermoplastics because they
A. are all crystalline.
B. can be melted and shaped.
C. are all amorphous.
D. are all used as insulators.

4. In this electrochemical cell, the reduction half reaction is

A. Zn(s) → Cu(s)
B. Zn(s) → Zn^{2+}(aq) + 2 e^{-}
C. Cu^{2+}(aq) → Zn^{2+}(aq)
D. Cu^{2+}(aq) + 2 e^{-} → Cu(s)
5. Which functional group do all monomers undergoing addition polymerization have in common?

A. \( \text{C}-\text{O} \)
B. \( \text{C}=\text{N} \)
C. \( \text{C}=\text{C} \)
D. \( \text{C}=\text{O} \)

6. Fission is the process of creating energy by
A. combining small nuclei to form a larger, less stable nucleus.
B. combining small nuclei to form a larger, more stable nucleus.
C. splitting large nuclei with bombarding neutrons.
D. splitting large nuclei with bombarding protons.

7. Sunlight (solar radiation) may be turned directly into electricity using _______ cells.
   A. fuel
   B. lead-acid
   C. photovoltaic
   D. electrolytic

8. A major advantage of a fuel cell over a standard battery is that
   A. as it generates electricity, a fuel cell produces more fuel than it uses.
   B. as long as oxygen and fuel are supplied, a fuel cell will not "run down" like a battery will.
   C. a fuel cell generates electricity without the need for an oxidation-reduction reaction.
   D. a fuel cell is 100% efficient at generating electricity, whereas a battery is less than 1% efficient.

9. In an electrochemical cell, the anode is
   A. always used up before the cathode.
   B. the electrode at which oxidation takes place.
   C. never a metal.
   D. the material used to connect the two half cells to each other.

10. Most high-level nuclear waste in the United States is currently
    A. sealed in deep pools at the sites where it was produced.
    B. encased in glass and buried near the surface.
    C. sealed deep within the Earth.
    D. stored at breeder reactors waiting for reprocessing.
11. This is the structure of propylene.

Which of these represents the "head-to-tail, head-to-tail" arrangement of monomers in polypropylene?

A.  

B.  

C.  

D.  

12. For safety reasons, high-level nuclear waste (HLW) must be contained
   A. until it becomes low-level nuclear waste.
   B. for 10 years.
   C. for 100 years.
   D. permanently.

13. Proteins are polymers of amino acids held together by ______ bonds.
   A. ester
   B. acid
   C. protein
   D. peptide

14. Incineration of plastics can be used to generate energy. One of the "Big Six" plastics releases hydrochloric acid, HCl, when incinerated. Which one?
   A. PS
   B. PET
   C. LDPE
   D. PVC

15. Electrolysis is a process that
   A. produces an electrical current.
   B. produces heat energy.
   C. requires heat energy.
   D. requires an electrical current.
16. Which of these is vinyl chloride?

A.  
\[
\begin{array}{c}
\text{H} \\
\text{H} \\
\text{C} = \text{C} \\
\text{Cl} \\
\text{H} \\
\text{H}
\end{array}
\]

B.  
\[
\begin{array}{c}
\text{H} \\
\text{H} \\
\text{C} = \text{C} \\
\text{H} \\
\text{H} \\
\text{H}
\end{array}
\]

C.  
\[
\begin{array}{c}
\text{H} \\
\text{H} \\
\text{C} = \text{C} \\
\text{CH}_3 \\
\text{H} \\
\text{H}
\end{array}
\]

D.  
\[
\begin{array}{c}
\text{H} \\
\text{H} \\
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\text{H} \\
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\text{H}
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17. Which statement best summarizes why a nuclear power plant cannot explode like a nuclear bomb?
A. The fuel concentration is too low to build the neutron stream required in an explosive chain reaction.
B. Control rods are in place among the fuel rods in the reactor.
C. The reactor cooling system is equipped with safety devices.
D. A nuclear explosion requires a chain reaction.

18. Chemical energy is converted directly into electrical energy in
A. an automobile’s engine.
B. a battery.
C. an electrolytic cell.
D. an electrical power plant.

19. Which naturally occurring type of radiation has the greatest penetrating power?
A. alpha
B. neutron
C. beta
D. gamma

20. How are HDPE and LDPE different?
A. Only one is a member of the "Big Six."
B. One is made by addition polymerization, one by condensation.
C. They are made from different monomers.
D. One has branched chains while one is linear.

21. In a galvanic cell,
A. electrolytes are added to carry electrons between electrodes.
B. electrical energy is used to reverse spontaneous chemical reactions.
C. oxidation takes place at the cathode.
D. oxidation and reduction take place at the same time at different electrodes.

22. Which naturally occurring radioactive particles are negatively charged?
A. neutrons
B. gamma radiation
C. alpha particles
D. beta particles
23. A polymer that is made from two different monomers is known as a
A. dimer.
B. multimer.
C. dipolymer.
D. copolymer.

24. Very small mercury batteries have been made and used in a multitude of applications. Why have they been replaced by other kinds of batteries for most applications?
A. These batteries cannot generate enough current for any modern devices.
B. Mercury is poisonous and difficult to dispose of.
C. Though they may be made very small, they are far too heavy to use in most applications.
D. Mercury has become far too expensive to use in batteries.

25. Which is true about radioactivity? Radioactivity
A. All of these choices are true.
B. damages white blood cells.
C. is used to treat certain cancers.
D. deforms DNA.
1. A monomer is
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