MCAT Practice Questions

Question 1.

Which of the following correctly identifies the atomic number and atomic mass of an element?

A) Atomic number = number of protons; atomic mass = sum of protons and neutrons
B) Atomic number = sum of protons and neutrons; atomic mass = number of electrons
C) Atomic number = number of neutrons; atomic mass = number of protons
D) Atomic number = total number of subatomic particles; atomic mass = number of protons

Question 2.

What is the valence electron configuration of sulfur (atomic number 16)?

A) $3s^2\ 3p^4$
B) $2s^2\ 2p^4$
C) $3s^2\ 3p^6$
D) $3d^4\ 4s^2$

Question 3.

Which element has the highest electronegativity?

A) Fluorine
B) Oxygen
C) Nitrogen
D) Carbon

Question 4.

How many moles are present in 36 grams of water (H_2O)? (Atomic masses: H = 1 g/mol, O = 16 g/mol)

A) 1 mole
B) 2 moles
C) 0.5 mole
D) 36 moles

Question 5.

Which type of chemical bond involves the sharing of electron pairs between atoms?

A) Ionic bond
B) Covalent bond
C) Metallic bond
D) Hydrogen bond

Question 6.

Balance the following equation:
$C_3H_8 + O_2 \rightarrow CO_2 + H_2O$
What is the coefficient in front of O_2 in the balanced equation?

A) 3
B) 5
C) 7
D) 10

Question 7.

In the redox reaction $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$, what is the species being reduced?

A) Zn
B) Cu^{2+}
C) Zn^{2+}
D) Cu

Question 8.

What is the common valency of nitrogen in most of its stable compounds?

A) 1
B) 2
C) 3
D) 4

Question 9.

Which functional group is represented by –OH?

A) Aldehyde
B) Ketone
C) Alcohol
D) Carboxylic acid

Question 10.

What is the hybridization of the central atom in methane (CH_4)?

A) sp
B) sp^2
C) sp^3
D) sp^3d

Question 11.

Which bond is the most polar?

A) C–H (ΔEN = 0.4)
B) C–F (ΔEN = 1.5)
C) C–C (ΔEN = 0)
D) C–Cl (ΔEN = 0.9)

Question 12.

In an SN2 reaction, the nucleophile attacks the electrophile from:

A) The same side as the leaving group
B) The opposite side of the leaving group
C) Any direction randomly
D) The electrophile does not get attacked in SN2

Question 13.

What is the molecular geometry of ammonia (NH_3)?

A) Linear
B) Trigonal planar
C) Tetrahedral
D) Trigonal pyramidal

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Question 15.

Which element is a key component of ATP but not typically found in carbohydrates?

A) Carbon
B) Hydrogen
C) Phosphorus
D) Oxygen

Question 16.

Which of the following amino acid side chains could act as a base under physiological pH (7.4)?

A) Aspartic acid
B) Glutamic acid
C) Lysine
D) Tyrosine

Question 17.

In the electron transport chain, which molecule acts as the final electron acceptor?

A) NAD^+
B) Oxygen (O_2)
C) $FADH_2$
D) ATP synthase

Question 18.

Which of the following metabolic pathways involves iron-containing enzymes for electron transfer?

A) Glycolysis
B) TCA cycle
C) Beta-oxidation
D) Electron transport chain

Question 19.

Which particle contributes most to the atomic mass of an atom?

A) Proton
B) Neutron
C) Electron
D) Positron

Question 20.

If a radioactive isotope has a half-life of 10 hours, what fraction of the original sample remains after 30 hours?

A) 1/8
B) 1/4
C) 1/2
D) 1/16

Question 21.

In atomic emission spectroscopy, the color of light emitted corresponds to:

A) Transitions of electrons between energy levels
B) Nuclear decay of the atom
C) Absorption of photons by electrons
D) Ionization of the atom

Question 22.

According to the Pauli exclusion principle, no two electrons in an atom can have the same:

A) Spin quantum number
B) Principal quantum number
C) Set of four quantum numbers
D) Orbital shape

Question 23.

Which of the following nuclear imaging modalities uses positron-emitting radioisotopes?

A) MRI
B) CT scan
C) PET scan
D) Ultrasound

Answer Key

1. A
2. A
3. A
4. A
5. B
6. B (Balanced equation: $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$)
7. B
8. C
9. C
10. C
11. B
12. B
13. D
14. C
15. C
16. C
17. B
18. D
19. B
20. A
21. A
22. C
23. C