

(VI) Read the passage given below and answer the following questions:

Within the 3d series, manganese exhibits oxidation states in aqueous solution from +2 to +7, ranging from $\text{Mn}^{2+}(\text{aq})$ to $\text{MnO}_4^- (\text{aq})$. Likewise, iron forms both $\text{Fe}^{2+}(\text{aq})$ and $\text{Fe}^{3+}(\text{aq})$ as well as the FeO_4^{2-} ion. Cr and Mn form oxyions CrO_4^{2-} , MnO_4^- , owing to their willingness to form multiple bonds. The pattern with the early transition metals—in the 3d series up to Mn, and for the 4d, 5d metals up to Ru and Os—is that the maximum oxidation state corresponds to the number of “outer shell” electrons. The highest oxidation states of the 3d metals may depend upon complex formation (e.g., the stabilization of Co^{3+} by ammonia) or upon the pH (thus $\text{MnO}_4^{2-} (\text{aq})$ is prone to disproportionation in acidic solution). Within the 3d series, there is considerable variation in relative stability of oxidation states, sometimes on moving from one metal to a neighbor; thus, for iron, Fe^{3+} is more stable than Fe^{2+} , especially in alkaline conditions, while the reverse is true for cobalt. The ability of transition metals to exhibit a wide range of oxidation states is marked with metals such as vanadium, where the standard potentials can be rather small, making a switch between states relatively easy.

(Cotton, S. A. (2011). Lanthanides: Comparison to 3d metals. *Encyclopedia of inorganic and Bioinorganic Chemistry*.)

In the following questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices on the basis of the above passage.

- A. Assertion and reason both are correct statements and reason is correct explanation for assertion.
- B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- C. Assertion is correct statement but reason is wrong statement.
- D. Assertion is wrong statement but reason is correct statement.

1. Assertion: Highest oxidation state is exhibited by transition metal lying in the middle of the series.

Reason: The highest oxidation state exhibited corresponds to number of (n-1)d electrons.

2. Assertion: Fe^{3+} is more stable than Fe^{2+}

Reason: Fe^{3+} has $3d^5$ configuration while Fe^{2+} has $3d^6$ configuration.

3. Assertion: Vanadium had the ability to exhibit a wide range of oxidation states.

Reason: The standard potentials Vanadium are rather small, making a switch between oxidation states relatively easy.

4. Assertion: Transition metals like Fe, Cr and Mn form oxyions

Reason: Oxygen is highly electronegative and has a tendency to form multiple bonds.

- A. 100%
- B. 38%
- C. 62%
- D. 80%

Q3. Which of the following statement is true?

- A. ATP is a nucleoside made up of nitrogenous base adenine and ribose sugar .
- B. ATP consists the nitrogenous base, adenine and the sugar, deoxyribose.
- C. ATP is a nucleotide which contains a chain of three phosphate groups bound to ribose sugar.
- D. The nitrogenous base of ATP is the actual power source.

Q4. Nearly 95% of the energy released during cellular respiration is due to:

- A. glycolysis occurring in cytosol
- B. oxidative phosphorylation occurring in cytosol
- C. glycolysis in occurring mitochondria
- D. oxidative phosphorylation occurring in mitochondria

Q5. Which of the following statements is correct:

- A. ATP is a nucleotide which has three phosphate groups, while ADP is a nucleoside which three phosphate groups.
- B. ADP contains nitrogenous bases adenine, ribose sugar and two phosphate groups bound to ribose.
- C. ADP is the main source of chemical energy in living matter.
- D. ATP and ADP are nucleosides which differ in number of phosphate groups.

(ANS: 1D,2B(Glucose catabolism yields a TOTAL of 38 ATP. $38 \text{ ATP} \times 7.3 \text{ kcal/mol ATP} = 262 \text{ kcal}$. Glucose has 686 kcal. Thus the efficiency of glucose metabolism is $262/686 \times 100 = 38\%$.) ,3C,4D,5B)

(XIV) Read the passage given below and answer the following questions:

The d block elements are the 40 elements contained in the four rows of ten columns (3-12) in the periodic table. As all the d block elements are metallic, the term d-block metals is synonymous. This set of d-block elements is also often identified as the transition metals, but sometimes the group 12 elements (zinc, cadmium, mercury) are excluded from the transition metals as the transition elements are defined as those with partly filled d or f shells in their compounds. Inclusion of the elements zinc, cadmium and mercury is necessary as some properties of the group 12 elements are appropriate logically to include with a discussion of transition metal chemistry.

The term transition element or transition metal appeared to derive from early studies of periodicity such as the Mendeleev periodic table of the elements. His horizontal table of the elements was an attempt to group the elements together so that the chemistry of elements might be explained and predicted. In this table there are eight groups labeled I-VIII with each subdivided into A and B subgroups. Mendeleev recognized that certain properties of elements in Group VIII are related to those of some of the elements in Group VII and those at the start of the next row Group I. In that sense, these elements might be described as possessing properties transitional from one row of the table to the next. (source: Winter, M. J. (2015). *D-block Chemistry* (Vol. 27). Oxford University Press, USA.)

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1. Assertion: Group 12 elements are not considered as transition metals.

Reason: Transition metals are those which have incompletely filled d shell in their compounds.

2. Assertion: All d block elements are metallic in nature.

Reason: The d –block elements belong to Group 3 -12 of the periodic table.

3. Assertion : Group VII elements of Mendeleev periodic table are transition elements.

Reason: Group I –VIII in Mendeleev periodic table is divided into two subgroups, A and B.

4. Assertion: Nickel is a transition element that belongs to group 10 and period 4 of the modern periodic table.

Reason: Electronic configuration of Nickel is $[\text{Ar}]_{18}3d^84s^2$

(ANS: 1A, 2B, 3D, 4A)

(XVI) Read the passage given below and answer the following questions:

Polysaccharides may be very large molecules. Starch, glycogen, cellulose, and chitin are examples of polysaccharides.

Starch is the stored form of sugars in plants and is made up of amylose and amylopectin (both polymers of glucose). Amylose is soluble in water and can be hydrolyzed into glucose units breaking glycosidic bonds, by the enzymes α -amylase and β -amylase. It is straight chain polymer. Amylopectin is a branched chain polymer of several D-glucose molecules. 80% of amylopectin is present in starch. Plants are able to synthesize glucose, and the excess glucose is stored as starch in different plant parts, including roots and seeds. The starch that is consumed by animals is broken down into smaller molecules, such as glucose. The cells can then absorb the glucose.

Glycogen is the storage form of glucose in humans and other vertebrates, and is made up of monomers of glucose. It is structurally quite similar to amylopectin. Glycogen is the animal equivalent of starch. It is stored in liver and skeletal muscles.

Cellulose is one of the most abundant natural biopolymers. The cell walls of plants are mostly made of cellulose, which provides structural support to the cell. Wood and paper are mostly cellulosic in nature.

Like amylose, cellulose is a linear polymer of glucose. Cellulose is made up of glucose monomers that are linked by bonds between particular carbon atoms in the glucose molecule. Every other glucose monomer in cellulose is flipped over and packed tightly as extended long chains. This gives cellulose its rigidity and high tensile strength—which is so important to plant cells. Cellulose passing through our digestive system is called dietary fiber.
(Source: <https://openstax.org/texts.org>)

1. In animals, Glycogen is stored in:
 - A. Liver
 - B. Spleen
 - C. Lungs
 - D. Small Intestine
2. Amylose is :
 - A. straight chain, water insoluble component of starch, which constitutes 20 % of it.
 - B. straight chain, water soluble component of starch, which constitutes 20 % of it.
 - C. branched chain, water insoluble component of starch, which constitutes 80 % of it.
 - D. branched chain, water soluble component of starch, which constitutes 80 % of it.
3. Which biopolymer breaks down to release glucose, whenever glucose levels drop in Our body :
 - A. starch
 - B. cellulose
 - C. chitin