

CHEMISTRY

BOOKS - CENGAGE CHEMISTRY

CHEMICAL REACTIONS

Mandatory Exercise Exercise Set I

1. Write balanced chemical equation for the reaction:

Magnesium reacts with steam forming magnesium oxide and liberating hydrogen.



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2. Write balanced chemical equation for the reaction:

Copper reacts with nitric acid to form copper nitrate, rediish brown

fumes of nitrogen dioxide, and water. **View Text Solution** 3. Write balanced chemical equation for the reaction: Hydrogen peroxide (H_2O_2) decomposes in the presence of manganes dioxide, to given oxygen and water. **View Text Solution** 4. Write balanced chemical equation for the reaction: Posphorous readily burns in chlorine gas, to form phosphrus pentachloride. **View Text Solution** 5. Write balanced chemical equation for the reaction: Butane (C_4H_{10}) burns in air to give carbon dioxide and water . Along with these two products, a large amount of heat energy is given out.



6. Balance the skeletal equation:

$$FeCl_3 + H_2O
ightarrow Fe(OH)_3 + HCl$$



7. Balance the skeletal equation:

$$KMnO_4 + HCl
ightarrow MnCl_2KCl + Cl_2(g)H_2O$$



8. Balance the skeletal equation:

$$H_4SO_4 + NaOH
ightarrow Na_2SO_4 + H_2O(l)$$



9. Balance the skeletal equation:

$$Al + HCl o AlCl_3 + H_2O$$

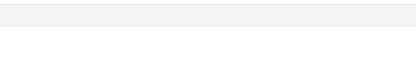


10. Balance the skeletal equation:

 $C_2H_5Br+KOH\stackrel{\Delta}{\longrightarrow} C_2H_5OH+KBr$

11. Balance the skeletal equation:

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12. What is the significance of coefficient in a balanced chemical equation?

 $FeSO_2 + KMnO_4 + H_2SO_4
ightarrow Fe_2(SO_4)_3 + MnSO_4 + K_2SO_4 + H_2O_4$



13. What is Redox reaction? Explain with example.



14. Which quantities are conserved in all oxidation reductin reaction.

A. Charge only

B. mass only

C. both

D. None

Answer: C



15. Identify oxidising and reducing agent in equation

$$H_2S + H_2O_2
ightarrow S + H_2O$$



16. Identify oxidising and reducing agent in equation

$$NH_3 + OCl^-
ightarrow N_2H_4 + Cl^-$$
 a



17. Identify oxidising and reducing agent in equation

$$SO_2 + H_2S o S + H_2O$$



18. Identify oxidising and reducing agent in equation

 $M^{3\,+} + MnO_4^-
ightarrow MO_3 + MnO_3$

19. Identify oxidising and reducing agent in equation

$$Zn + NO_3^- o NH_4^+ + Zn^{2+} + H_2O$$



20. Identify oxidising and reducing agent in equation

$$CH_3CH_2OH + Cl_2
ightarrow CH_3CHO + 2HCl$$



21. Identify oxidising and reducing agent in equation

$$CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$$



22. Identify oxidising and reducing agent in equation

$$P_4 + 3NaOH + 3H_2O \rightarrow 3NaH_2PO_2 + PH_3$$



23. Identify oxidising and reducing agent in equation

$$HI + H_2SO_4
ightarrow I_2 + SO_2 + H_2O$$



24. Identify oxidising and reducing agent in equation

$$NaNO_2+KI+H_2SO_4
ightarrow Na_2SO_4+K_2SO_4+NO+H_2O+I_2$$



25. The reaction $Ag^{2+}(aq) + Ag(s) \Leftrightarrow 2Ag^{+}(aq)$ An example of.

A. Reduction

B. Oxidation

C. Disproportionation

D. none

Answer: C



26. Identify the redox & non redox reaction

$$Ca(OH)_2 + 2HCl
ightarrow CaCl_2 + 2H_2O$$



27. Identify the redox & non redox reaction

$$2S_2O_7^{2\,-}\,+2H_2O
ightarrow\,2SO_4^{2\,-}\,+4H^{\,+}$$



28. Identify the redox & non redox reaction

 $BaCl_2 + MgSO_4 \rightarrow BaSO_4 + MgCl_2$



29. Identify the redox & non redox reaction

 $Cu_2S + 2FeO
ightarrow 2Cu + 2Fe + SO_2$



30. Identify the redox & non redox reaction

 $P_4 + NaOH
ightarrow PH_3 + NaH_2PO_2$



31. Identify the redox & non redox reaction

$$KMnO_4 + H_2C_2O_4 + H^+
ightarrow MnO + CO_2 + H_2O$$



Mandatory Exercise Exercise Set Ii

1. Fill in the blank

 $KMnO_4$ is an example of a ____ agent.



2. Fill in the blank

 $2H_2S+SO_2
ightarrow 2H_2O+3S\downarrow$. In the above reaction, H_2S has been

oxidised to _____



3. Fill in the blank							
	3	Fill	in	the	h	lan	k

An oxidising agent is an electron _____



4. Fill in the blank

The change from $FeCl_3$ to $FeCl_2$ is _____



5. Explain oxidation and reduction with the help of reaction:

 $2KClO_3
ightarrow 2KCl + 3O_2$



6. Explain oxidation and reduction with the help of reaction:

 $2Na+H_2
ightarrow 2NaH$

7. Breaking of lead broide into lead and bromine is an example of

A. decomposition reaction

B. photochemical reacton

C. diplacement reaction

D. neutralisation reaction

Answer: A



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8. $PbO + 4HCl \rightarrow PbCl + 2HO + Cl$, the substnce undergoing oxidation is

A. lead dioxide

B. hydrochloric acid

C. hydrogen

D. lead chloride

Answer: B



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9. Which of the following is a redox reaction?

A.
$$CaCO_3
ightarrow CaO + CO_2$$

B.
$$H_2 + Cl_2
ightarrow 2HCl$$

C.
$$CaO + 2HCl
ightarrow CaCl_2 + H_2O$$

D.
$$Ca(OH)_2 + 2HCl
ightarrow CaCl_2 + 2H_2O$$

Answer: B



10. Which of the following is a redox reaction?

A.
$$NaOH + HCl
ightarrow NaCl + H_2O$$

B.
$$BaCl_2 + H_2SO_4
ightarrow BaSO_4 + 2HCl$$

C.
$$CuSO_4 + 2H_2O
ightarrow Cu(OH)_2 + H_2SO_4$$

D.
$$Zn + 2HCl
ightarrow ZnCl_2 + H_2$$

Answer: A



- **11.** Conversion of sugar into CO_2 is an example of
 - A. oxidation
 - B. reduction
 - C. redox
 - D. none

Answer: A



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12. Indicated number of electrons involved in following change & identify the process as reduction or oxidation.

 $Br_2 o BrO_3^-$



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13. Indicated number of electrons involved in following change & identify the process as reduction or oxidation.

 $KMnO_4
ightarrow K_2MnO_4$



14. Indicated number of electrons involved in following change & identify the process as reduction or oxidation.

$$NH_3 o N_2H_4$$



15. Indicated number of electrons involved in following change & identify the process as reduction or oxidation.

$$CO o CO_2$$



16. Indicated number of electrons involved in following change & identify the process as reduction or oxidation.

$$Br_2 o HOBr$$



17. Indicated number of electrons involved in following change & identify the process as reduction or oxidation.

$$Cr_2O_7^{2\,-}
ightarrow\,Cr^{3\,+}$$



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18. Indicated number of electrons involved in following change & identify the process as reduction or oxidation.

$$NH_2
ightarrow N_2$$



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19. Indicated number of electrons involved in following change & identify the process as reduction or oxidation.

$$Kigl[Ag(CN)_2igr] o Ag$$



20. Indicated number of electrons involved in following change & identify the process as reduction or oxidation.

 $PH_3 o NaH_2PO_2$



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21. Indicated number of electrons involved in following change & identify the process as reduction or oxidation.

$$H_2C_2O_4 o CO_2$$



Mandatory Exercise Exercise Set lii

1. Identify the oxidised and reduced components in the following reactions:

$$4NH_2+5O_2
ightarrow4NO+6H_2O$$



OII

2. Identify the oxidised and reduced components in the following reactions:

$$Ag_2O
ightarrow 2Ag+rac{1}{2}O_2$$



3. Identify the oxidised and reduced components in the following reactions:

$$NiO + H_2
ightarrow Ni + H_2O$$



4. Identify the oxidised and reduced components in the following reactions:

$$PbS + 4H_2O_2
ightarrow PbSO_4 + 4H_2O$$



5. Identify the oxidised and reduced components in the following reactions:

$$2H_2S+SO_2
ightarrow 2H_2+3S\downarrow$$



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6. Consider these reactions and answer the questions listed below in each case:

$$I.\ Zn + PbCl_2
ightarrow Pb + ZnCl_2$$

II.
$$Mg + Cl_2 o MgCl_2$$

III.
$$Cu+4HNO_2
ightarrow Cu(NO_3)_2+2NO_2+2H_2O$$

A. Which reactant is oxidised to what?

B. Which reactant is oxidiser?

C. Which reactant is reduced to what?

D. Which reactant is reducer?

Answer:



7. Balance the redox reaction by the oxidation number method:

$$HI+Cl_2
ightarrow HCl+I_2$$



8. Balance the redox reaction by the oxidation number method :

$$SnO_2 + C \rightarrow Sn + CO$$



9. Balance the redox reaction by the oxidation number method:

$$KClO_2 \rightarrow KCl + O_2$$



10. Select the correct statement in the following reacton : $NH_4NO_2
ightarrow N_2 + 2H_2O.$

A. Oxidation number of N is changed from -2 to +2 .

B. Ocidation number of N in $NH_4^{\,+}$ is changed from - 3 to 0 and that in $NO_2^{\,-}$ is changed from +3 to 0 .

C. Oxidation number of N in NH_4^+ is changed from +1 to 0 and that in NO_2^- is changed from -1 to 0.

D. No change

Answer: B



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11. In the reaction $\overset{0}{C}u+\overset{+1}{H_2}SO_4
ightarrow \overset{2+}{C}uSO_4^{2-} + H_2O+SO_2$

A. $H^{\,+}$ is the oxidising agent

B. SO_4^2 is the oxidising agent

C. both are correct

D. none is correct

Answer: B



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12. In the reaction $SO_2+2H_2S
ightarrow 3S+2H_2, \,$ the substance oxidised is

A. H_2S

B. SO_2

D. H_2O

 $\mathsf{C}.\,S$

Answer: A



13. In the reaction $3Cl_3+6NaOH \rightarrow NaClO_3+5NaCl+3H_2O,$ which element loses as well as gains electrons ?

A. Na

B.O

C. Cl

D. None

Answer: D



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14. For the reaction

 $NH_3 + OCl^-
ightarrow N_2H_4 + Cl^-$

Occurring in basic medium, the coefficient of N_2H_4 in the balanced equation will be

A. 1 B. 2 C. 3 D. 4 **Answer: A View Text Solution 15.** In the reaction $SO_2+2H_2S
ightarrow3S+2H_2O,\,$ the substance oxidised is A. H_2S B. SO_2 $\mathsf{C}.\,S$ D. H_2O

Answer: A

16. Conversing of methanol into methonoic acid is

A. Oxidation

B. reduction

C. Combustion

D. All

Answer: A



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oxidation number of Cr changes from

17. In the equation $CrO_4^{2-} + SO_3^{2-}
ightarrow Cr(OH)_4 + SO_4^{2-}$

A. 6 to 4

B. 6 to 3

C. 8 to 4

D. 4 to 3

Answer: A



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18. During reaction of SO_2 with $K_2Cr_2O_7$ in acidic medium, the oxidation state of S changed from

A. 4 to 0

B. 4 to 2

C. 4 to 6

D. 6 to 4

Answer: C



19. The reaction

 $P_4 + 3NaOH + 3H_2O
ightarrow 3NaH_2PO_2 + PH_3$ is an example of

- A. Pyrolytic reaction
- B. Disproportionation reaction
- C. neutralisation reaction
- D. double decomposition reaction

Answer: B



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20. In the Ionic equation

 $BiO_3^- + 6H^{\,\oplus} + xe^-
ightarrow Bi^{3\,+} + 3H_2O$ the value of x is

- A. 6
- B. 2
- C. 4

Answer: B



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21. In which of the following reaction , hydrogen acting as an oxidising agent ?

A. with Li to form Li H

B. with I_2 to give HI

C. with S to given H_2S

D. None

Answer: A



22. Which of the following acts as an oxidising as well as reducing agent				
?				
A. Na_2O				
B. CaO				
C. $NaNO_3$				
D. $NaNO_2$				
Answer: D				
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23. Which of the following acts as oxidising agent?				
A. H_2SO_4				
B. $HClO_4$				
C. HNO_3				

D. All

Answer: D



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Consolidated Exercise Comprehension

1. Balancing redox reaction by ion-electron method

Chemical reactions which involve oxidation and reduction (redox reactions) can also be balanced by using the ion-electron method or half-equation method. This method of balancing redox reactions is based upon the principle that electrons lost during oxidation half-reaction of any redox reaction are equal to the electrons gained during reduction half-reaction.

Balance the redox reaction ion-electron method:

$$Zn+NO_3^-
ightarrow Zn^{2+}+NH_3^+$$
 (acidic medium)



2. Balancing redox reaction by ion-electron method

Chemical reactions which involve oxidation and reduction (redox reactions) can also be balanced by using the ion-electron method or half-equation method. This method of balancing redox reactions is based upon the principle that electrons lost during oxidation half-reaction of any redox reaction are equal to the electrons gained during reduction half-reaction.

Balance the redox reaction ion-electron method:

$$Cl_2 + OH^-
ightarrow Cl^- + ClO_3^-$$
 (basic medium)



3. Balancing redox reaction by ion-electron method

Chemical reactions which involve oxidation and reduction (redox reactions) can also be balanced by using the ion-electron method or half-equation method. This method of balancing redox reactions is based upon the principle that electrons lost during oxidation

halfreaction of any redox reaction are equal to the electrons gained during reduction half-reaction.

Balance the redox reaction ion-electron method:

$$SO_2 + Cr_2O_7^{2\,-}
ightarrow SO_4^{2\,-} + Cr^{3\,+}$$
 (acidic medium)



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4. Balancing redox reaction by ion-electron method

Chemical reactions which involve oxidation and reduction (redox reactions) can also be balanced by using the ion-electron method or half-equation method. This method of balancing redox reactions is based upon the principle that electrons lost during oxidation half-reaction of any redox reaction are equal to the electrons gained during reduction half-reaction.

Balance the redox reaction ion-electron method:

$$MnO_4^- + H_2O_2
ightarrow MnO_2 + O_2$$
 (basic medium)



5. Balancing redox reaction by ion-electron method

Chemical reactions which involve oxidation and reduction (redox reactions) can also be balanced by using the ion-electron method or half-equation method. This method of balancing redox reactions is based upon the principle that electrons lost during oxidation half-reaction of any redox reaction are equal to the electrons gained during reduction half-reaction.

Balance the redox reaction ion-electron method:

 $Br_2 + H_2O_2
ightarrow BrO_3^- + H_2O$ (acidic medium)



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6. Match the following half-reaction in column A with the change in the oxidation number in column B.





1. Balance the following redox reactions by the oxidation number method:

$$Cu + HNO_3
ightarrow Cu(NO_3)_2 + NO_2 + H_2O$$



2. Balance the following redox reactions by the oxidation number method:

$$MnO_2 + Al
ightarrow Mn + AlO_3$$



3. Balance the following redox reactions by the oxidation number method:

$$Zn+NO_3^-
ightarrow Zn^{2+}+NH_4^+$$



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4. Balance the following redox reactions by the oxidation number method:

$$Cu_2O+H^++NO_3^-
ightarrow Cu^{2+}+NO+H_2O$$



5. Balance the following redox reactions by the oxidation number method:

$$MnO_4^- + Br^- o Mn^{2+} + Br_2$$



Olympiad And Ntse Level Excercises

1. Match the process in column I with their respective names in column

II.





2. When copper is treated with a certain concentration of nitric acid, nitric oxide and nitrogen dioxde are liberated in equal volumes according of the equation

 $xCu+yHNO_3
ightarrow Cu(NO_3)_2+NO+NO_2+H_2O$ The coefficients ${\sf x}$ and ${\sf y}$ are

- A. 2 and 3
- B. 2 and 6
- C. 1 and 3
- D. 3 and 8

Answer: B



3. Which of the following represents redo reactions?

I.
$$Cr_2O_7^{2\,-}+2\overset{\Theta}{O}H
ightarrow 2CrO_4^{2\,-}+H_2O$$

II. $Zn + CuSo_4
ightarrow ZnSO_4 + Cu$

III.
$$2MnO_4^{\,\Theta}\,+3Mn^{2\,+}\,+\overset{\Theta}{4OH}
ightarrow\,5MnO_2\,+\,2H_2O$$

IV.
$$2Cu \stackrel{\Theta}{\longrightarrow} Cu + Cu^{2+}$$

A. I, II

B. I,III,

C. III,IV

D. II,III,

Answer: D



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4. Which of the following is not a disproportionation reaction?

A. $KO_2 + H_2O + CO_2
ightarrow KHCO_3 + O_2$

B. $KClO_3 \rightarrow KClO_4 + KCl$

C. $PbO_2 + H_2O \rightarrow PbO + H_2O_2$

 $\mathsf{D}.\,OHC-COOH \stackrel{\Theta}{\longrightarrow} HOH_2C-COOH + \stackrel{\Theta}{OOC}-COO\Theta$

Answer: C



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5. $aK_2Cr_2O_7+bKCl+cH_2SO_4 ightarrow xCrO_2Cl_2+yKHSO_4+zH_2O$

The aboe equation balance when

A. a = 2, b = 4, c = 6 and x = 2, y = 6, z = 3

B. a = 4, b = 2, c = 6 and x = 6, y = 2, z = 3

C. a = 6, b = 4, c = 2 and x = 6, y = 3, z = 2

D. a = 1, b = 4, c = 6 and x = 2, y = 6, z = 3

Answer: D



6. The number of moles of $KMnO_4$ required to oxidise 1 mole of $Fe(C_2O_4)$ in acidic medium is

 $\mathsf{A.}\ 0.6$

B. 1.67

 $\mathsf{C.}\ 0.2$

 $\mathsf{D.}\,0.4$

Answer: A



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7. The number of peroxide bonds in perxenate ion $\left[XeO_6
ight]^{4-}$ is

A. 0

B. 2

C. 3
D. 1
Answer: A
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8. An element that never has a positive oxidation state in any of its
compounds is
A. Boron
B. Oxygen
C. Chlorine
D. Fluorine

Answer: D

9. Which of the following reactions does not involve either oxidation or reduction?

A.
$$VO^{2+}
ightarrow V_2O_3$$

B.
$$Na o Na^{\,\oplus}$$

C.
$$CrO_4^{2-}
ightarrow Cr_2O_7^{2-}$$

D.
$$Zn^{2+}
ightarrow Zn$$

Answer: C



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10. The oxidation number of phosphorous

in

 $PO_4^{3-}, P_4O_{10}, \text{ and } P_2O_7^{4-} \text{ is}$

$$\mathsf{A.}+5$$

$$B. + 3$$

$$\mathsf{C.}-3$$

D. + 2

Answer: A

