Chemical Reaction and Equation

1.1 Chemical Equations

MCQ

1. Sodium reacts with water to form sodium hydroxide and hydrogen gas. The balanced equation which represents the above reaction is
   (a) $Na_{(s)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + 2H_{2(g)}$
   (b) $2Na_{(s)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + H_{2(g)}$
   (c) $2Na_{(s)} + 2H_2O_{(l)} \rightarrow NaOH_{(aq)} + 2H_{2(g)}$
   (d) $2Na_{(s)} + H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + 2H_{2(g)}$
   (Term I, 2021-22) Ap

2. It is important to balance the chemical equations to satisfy the law of conservation of mass. Which of the following statements of the law is incorrect?
   (a) The total mass of the elements present in the reactants is equal to the total mass of the elements present in the products.
   (b) The number of atoms of each element remains the same, before and after a chemical reaction.
   (c) The chemical composition of the reactants is the same before and after the reaction.
   (d) Mass can neither be created nor can it be destroyed in a chemical reaction.
   (Term I, 2021-22) U

3. In which of the following, the identity of initial substance remains unchanged?
   (a) Curdling of milk
   (b) Formation of crystals by process of crystallisation
   (c) Fermentation of grapes
   (d) Digestion of food *(2020)*

4. Identify '*x*', '*y*' and '*z*' in the following reaction :
   $2KClO_{3(x)} \xrightarrow{y} 2KCl_{(x)} + O_{2(z)}$
   (a) *x* = gas; *y* = reaction condition; *z* = gas
   (b) *x* = solid; *y* = liquid; *z* = gas
   (c) *x* = number of moles of $KClO_3$; *y* = reaction condition; *z* = number of molecules of oxygen
   (d) *x* = physical state of $KClO_3$ and KCl; *y* = reaction condition, *z* = physical state of O_2. *(2020)*

5. **Assertion (A) :** Following is a balanced chemical equation for the action of steam on iron :
   $3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$
   Reason (R) : The law of conservation of mass holds good for a chemical equation.
   (a) Both (A) and (R) are true and reason (R) is the correct explanation of the assertion (A).
   (b) Both (A) and (R) are true, but reason (R) is not the correct explanation of the assertion (A).
   (c) (A) is true, but (R) is false.
   (d) (A) is false, but (R) is true. *(2020)*

VSA (1 mark)

6. What is a balanced chemical equation ? *(2021 C)*

7. Translate the following statement into a balanced chemical equation :
   "Barium chloride reacts with aluminium sulphate to give aluminium chloride and barium sulphate."
   (2019)

SA I (2 marks)

8. Give the chemical name of the reactants as well as the products of the following chemical equation:
   $HNO_3 + Ca(OH)_2 \longrightarrow Ca(NO_3)_2 + H_2O$ *(2021 C)*

SA II (3 marks)

9. Explain the significance of photosynthesis. Write the balanced chemical equation involved in the process.
   (Board Term I, 2017) U

10. Write balanced chemical equations for the following chemical reactions :
    (a) Hydrogen + Chlorine → Hydrogen chloride
    (NCERT Intext)
    (b) Lead + Copper chloride →
    Lead chloride + Copper
    (c) Zinc oxide + Carbon → Zinc + Carbon monoxide
    (Board Term I, 2014)

1.2 Types of Chemical Reactions

MCQ

11. When aqueous solutions of potassium iodide and lead nitrate are mixed, an insoluble substance separates out. The chemical equation for the reaction involved is
    (a) $KI + PbNO_3 \longrightarrow PbI + KNO_3$
    (b) $2KI + Pb(NO_3)_2 \longrightarrow PbI_2 + 2KNO_3$
    (c) $KI + Pb(NO_3)_2 \longrightarrow PbI + KNO_3$
    (d) $KI + PbNO_3 \longrightarrow PbI_2 + KNO_3$ *(2023)* U

12. A metal ribbon 'X' burns in oxygen with a dazzling white flame forming a white ash 'Y'. The correct description of *X*, *Y* and the type of reaction is
    (a) *X* = Ca; *Y* = CaO;
    Type of reaction = Decomposition
    (b) *X* = Mg; *Y* = MgO;
    Type of reaction = Combination
    (c) *X* = Al; *Y* = Al_2O_3;
    Type of reaction = Thermal decomposition
    (d) *X* = Zn; *Y* = ZnO;
    Type of reaction = Endothermic *(2023)*

13. The balanced chemical equation showing reaction between quick lime and water is
(a) $2CaO + H_2O \longrightarrow 2CaOH + H_2 + Heat$
(b) $CaO + H_2O \longrightarrow Ca(OH)_2 + H_2 + Heat$
(c) $CaO + H_2O \longrightarrow Ca(OH)_2 + Heat$
(d) $2CaO + 3H_2O \longrightarrow 2Ca(OH)_3 + O_2 + Heat$
(2023)

14. Study the following chemical reaction:
$2Na_{(s)} + 2H_2O_{(l)} \longrightarrow 2NaOH_{(aq)} + H_{2(g)}\uparrow$
The reducing agent in this reaction is
(a) Na (b) H_2O (c) NaOH (d) H_2
(2023)

15. **Assertion (A) :** In the following reaction
$ZnO + C \longrightarrow Zn + CO$
ZnO undergoes reduction.
Reason (R) : Carbon is a reducing agent that reduces ZnO to Zn.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A)
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A)
(c) Assertion (A) is true, but Reason (R) is False.
(d) Assertion (A) is false, but Reason (R) is true.
(2023) Ap

16. **Assertion (A) :** Reaction of quick lime with water is an exothermic reaction.
Reason (R) : Quicklime reacts vigorously with water releasing a large amount of heat.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A)
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A)
(c) Assertion (A) is true, but Reason (R) is False.
(d) Assertion (A) is false, but Reason (R) is true.
(2023)

17. A student took sodium sulphate solution in a test tube and added barium chloride solution to it. He observed that an insoluble substance has formed. The colour and molecular formula of the insoluble substance is
(a) grey, Ba_2SO_4 (b) yellow, $Ba(SO_4)_2$
(c) white, $BaSO_4$ (d) pink, $BaSO_4$
(Term I, 2021-22) An

18. $C_6H_{12}O_{6(aq)} + 6O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O_{(l)}$
The above reaction is a/an
(a) displacement reaction
(b) endothermic reaction
(c) exothermic reaction
(d) neutralisation reaction. *(Term I, 2021-22)* U

19. Which of the following statement about the reaction given below are correct?
$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$
(i) HCl is oxidized to Cl_2.
(ii) MnO_2 is reduced to $MnCl_2$.
(iii) $MnCl_2$ acts as an oxidizing agent.
(iv) HCl acts as an oxidizing agent.
(a) (ii), (iii) and (iv) (b) (i), (ii) and (iii)
(c) (i) and (ii) only (d) (iii) and (iv) only
(Term I, 2021-22)

20. Which one of the following reactions is catogorised as thermal decomposition reaction?
(a) $2H_2O_{(l)} \rightarrow 2H_{2(g)} + O_{2(g)}$
(b) $2AgBr_{(s)} \rightarrow 2Ag_{(s)} + Br_{2(g)}$
(c) $2AgCl_{(s)} \rightarrow 2Ag_{(s)} + Cl_{2(g)}$
(d) $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$ *(Term I, 2021-22)* An

21. **Assertion (A) :** Burning of natural gas is an endothermic process.
Reason (R) : Methane gas combines with oxygen to produce carbon dioxide and water.
(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true. *(Term I, 2021-22)*

22. Consider the following processes
I. Dilution of sulphuric acid
II. Sublimation of dry ice
III. Condensation of water vapours
IV. Dissolution of ammonium chloride in water
The endothermic process(es) is/are
(a) I and III (b) II only (c) III only (d) II and IV
(Term I, 2021-22) An

23. When lead nitrate powder is heated in boiling tube, we observe
(a) brown fumes of nitrogen dioxide
(b) brown fumes of lead oxide
(c) yellow fumes of nitrogen dioxide
(d) brown fumes of nitric oxide.
(Term I, 2021-22) R

24. **Assertion (A) :** Silver salts are used in black and white photography.
Reason (R) : Silver salts do not decompose in the presence of light.
(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true. *(Term I, 2021-22)*

25. Calcium oxide reacts vigorously with water to produce slaked lime.
$CaO_{(s)} + H_2O_{(l)} \longrightarrow Ca(OH)_{2(aq)}$

This reaction can be classified as
(A) combination reaction
(B) exothermic reaction
(C) endothermic reaction
(D) oxidation reaction.
Which of the following is a correct option?
(a) (A) and (C) (b) (C) and (D)
(c) (A), (C) and (D) (d) (A) and (B) *(2020)* U

26. When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and the sulphuric acid so formed remains in the solution. The reaction is an example of a
(a) combination reaction
(b) displacement reaction
(c) decomposition reaction
(d) double displacement reaction. *(2020)*

27. In a double displacement reaction such as the reaction between sodium sulphate solution and barium chloride solution :
(A) exchange of atoms takes place
(B) exchange of ions takes place
(C) a precipitate is produced
(D) an insoluble salt is produced
The correct option is
(a) (B) and (D) (b) (A) and (C)
(c) only (B) (d) (B), (C) and (D)
(2020) An

28. $CH_4 + Cl_2 \xrightarrow{\text{Sunlight}} CH_3Cl + HCl$
The above reaction is an example of
(a) displacement reaction
(b) addition reaction
(c) substitution reaction
(d) double displacement reaction. *(2020 C)*

VSA (1 mark)

29. Name the type of chemical reaction which takes place when quicklime is added to water.*(2021 C)* R

SA I (2 marks)

30. What is observed after about 1 hour of adding the strips of copper and aluminium separately to ferrous sulphate solution filled in two beakers ?
Name the reaction if any change in colour is noticed. Also, write chemical equation for the reaction.
(2019)

31. A student wants to study a decomposition reaction by taking ferrous sulphate crystals. Write two precautions he must observe while performing the experiment. *(2019)*

32. Classify the following reactions into different types :
(i) $AgNO_3(aq) + NaCl(aq) \longrightarrow AgCl(s) + NaNO_3(aq)$
(ii) $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$
(iii) $2KClO_3(s) \xrightarrow{\Delta} 2KCl(aq) + 3O_2(g)$
(iv) $Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$ *(2019)*

33. A student mixes sodium sulphate powder in barium chloride powder.
What change would the student observe on mixing the two powders?
Justify your answer and explain how he can obtain the desired change. *(2019)*

34. Study the following equation of a chemical reaction :
$H_2 + Cl_2 \rightarrow 2HCl$
(i) Identify the type of reaction.
(ii) Write a balanced chemical equation of another example of this type of reaction.
(Board Term I, 2015)

35. State the type of chemical reactions, represented by the following equations :
(a) $A + BC \rightarrow AC + B$
(b) $A + B \rightarrow C$
(c) $PQ + RS \rightarrow PS + RQ$
(d) $A_2O_3 + 2B \rightarrow B_2O_3 + 2A$ *(Board Term I, 2014)* An

SA II (3 marks)

36. (i) While electrolysing water before passing the current some drops of an acid are added. Why? Name the gases liberated at cathode and anode. Write the relationship between the volume of gas collected at anode and the volume of gas collected at cathode.
(ii) What is observed when silver chloride is exposed to sunlight? Give the type of reaction involved. *(2023)* An

37. (a) Define a double displacement reaction.
(b) Write the chemical equation of a double displacement reaction which is also a (i) Neutralisation reaction and (ii) Precipitation reaction. Give justification for your answer.
(2023)

38. Mention with reason the colour changes observed when :
(i) silver chloride is exposed to sunlight.
(ii) copper powder is strongly heated in the presence of oxygen.
(iii) a piece of zinc is dropped in copper sulphate solution. *(2020)*

39. A shining metal '*M*', on burning gives a dazzling white flame and changes to a white powder '*N*'.
(a) Identify '*M*' and '*N*'.
(b) Represent the above reaction in the form of a balanced chemical equation.
(c) Does '*M*' undergo oxidation or reduction in this reaction ? Justify. *(2020)*

40. In the electrolysis of water
(a) Name the gases liberated at anode and cathode.
(b) Why is it that the volume of gas collected on one electrode is two times that on the other electrode ?
(c) What would happen if dil. H_2SO_4 is not added to water ? *(2020)*

41. 1 g of copper powder was taken in a China dish and heated. What change takes place on heating? When hydrogen gas is passed over this heated substance, a visible change is seen in it. Give the chemical equations of reactions, the name and the colour of the products formed in each case. *(2020)*

42. A compound 'A' is used in the manufacture of cement. When dissolved in water, it evolves a large amount of heat and forms compound '*B*'.
    (i) Identify *A* and *B*.
    (ii) Write chemical equation for the reaction of *A* with water.
    (iii) List two types of reaction in which this reaction may be classified. *(2020)*

43. Identify the type of each of the following reactions. Also write balanced chemical equation for each reaction.
    (i) A reaction in which the reaction mixture becomes warm.
    (ii) A reaction in which an insoluble substance is formed. *(2020)*

44. Lead nitrate solution is added to a test tube containing potassium iodide solution.
    (a) Write the name and colour of the compound precipitated.
    (b) Write the balanced chemical equation for the reaction involved.
    (c) Name the type of this reaction justifying your answer. *(2020)* Ap

45. 2 g of silver chloride is taken in a China dish and the China dish is placed in sunlight for sometime. What will be your observation in this case? Write the chemical reaction involved in the form of a balanced chemical equation. Identify the type of chemical reaction. *(Delhi 2019)*

46. Identify the type of reactions taking place in each of the following cases and write the balanced chemical equation for the reactions.
    (a) Zinc reacts with silver nitrate to produce zinc nitrate and silver.
    (b) Potassium iodide reacts with lead nitrate to produce potassium nitrate and lead iodide.
    (Delhi 2019) Ap

47. When potassium iodide solution is added to a solution of lead (II) nitrate in a test tube, a precipitate is formed.
    (a) What is the colour of this precipitate ? Name the compound precipitated.
    (b) Write the balanced chemical equation for this reaction.
    (c) List two types of reactions in which this reaction can be placed. *(2019)*

48. 2 g of ferrous sulphate crystals are heated in a dry boiling tube.
    (a) List any two observations.
    (b) Name the type of chemical reaction taking place.
    (c) Write balanced chemical equation for the reaction and name the products formed.
    (AI 2019, Board Term I, 2017, 2016)

49. You might have noted that when copper powder is heated in a China dish, the reddish brown surface of copper powder becomes coated with a black substance.
    (a) Why has this black substance formed?
    (b) What is the black substance?
    (c) Write the chemical equation of the reaction that takes place.
    (d) How can the black coating on the surface be turned reddish brown? *(AI 2019)*

50. Decomposition reactions require energy either in the form of heat or light or electricity for breaking down the reactants. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity. *(2018)* U

51. Take 3 g of barium hydroxide in a test tube, now add about 2 g of ammonium chloride and mix the contents with the help of a glass rod. Now touch the test tube from outside.
    (i) What do you feel on touching the test tube?
    (ii) State the inference about the type of reaction occurred.
    (iii) Write the balanced chemical equation of the reaction involved. *(Board Term I, 2017)*

52. (a) A solution of potassium chloride when mixed with silver nitrate solution, an insoluble white substance is formed. Write the chemical reaction involved and also mention the type of the chemical reaction. *(NCERT Exemplar)*
    (b) Ferrous sulphate when heated, decomposes with the evolution of a gas having a characteristic odour of burning sulphur. Write the chemical reaction involved and identify the type of reaction. *(Board Term I, 2016)* Cr

53. Name the type of chemical reaction represented by the following equation :
    (i) $CaO + H_2O \rightarrow Ca(OH)_2$
    (ii) $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 2AlCl_3 + 3BaSO_4$
    (iii) $2FeSO_4 \xrightarrow{\text{Heat}} Fe_2O_3 + SO_2 + SO_3$
    (Board Term I, 2016) An

54. What is a reduction reaction?
    Identify the substances that are oxidised and the substances that are reduced in the following reactions.
    (a) $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$
    (b) $2PbO + C \rightarrow 2Pb + CO_2$ *(Board Term I, 2015)*

LA (5 marks)

55. (a) Can a displacement reaction be a redox reaction? Explain with the help of an example.
(b) Write the type of chemical reaction in the following :
(i) Reaction between an acid and a base
(ii) Rusting of iron. *(Board Term I, 2017)*

1.3 Have You Observed the Effects of Oxidation Reactions in Everyday Life?

MCQ

56. Copper utensils slowly lose their shiny brown surface and gain a green coat on prolonged exposure to atmospheric air. This is due to the formation of a coating of
(a) copper sulphate
(b) copper carbonate
(c) cupric oxide
(d) cuprous oxide. *(2020 C)*

SA II (3 marks)

57. What happens when food materials containing fats and oils are left for a long time? List two observable changes and suggest three ways by which this phenomenon can be prevented. *(2020)* U

58. (a) In the following reaction :
$MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$
Identify the oxidant and reductant.
(b) Give reasons :
(i) Antioxidants are added to foods containing fats and oils.
(ii) White silver chloride turns grey in sunlight. *(2019 C)*

59. (i) Why is respiration considered as an exothermic reaction? *(NCERT)*
(ii) Write chemical name and the formula of the brown gas produced during thermal decomposition of lead nitrate.
(iii) Why do chips manufactures flush bags of chips with gas such as nitrogen? *(Board Term I, 2015)*

CBSE Sample Questions

1.1 Chemical Equations

MCQ

1. Which of the following correctly represents a balanced chemical equation ?
(a) $Fe_{(s)} + 4H_2O_{(g)} \rightarrow Fe_3O_{4(s)} + 4H_{2(g)}$
(b) $3Fe_{(s)} + 4H_2O_{(g)} \rightarrow Fe_3O_{4(s)} + 4H_{2(g)}$
(c) $3Fe_{(s)} + H_2O_{(g)} \rightarrow Fe_3O_{4(s)} + H_{2(g)}$
(d) $3Fe_{(s)} + 4H_2O_{(g)} \rightarrow Fe_3O_{4(s)} + H_{2(g)}$
(Term I, 2021-22) Ap

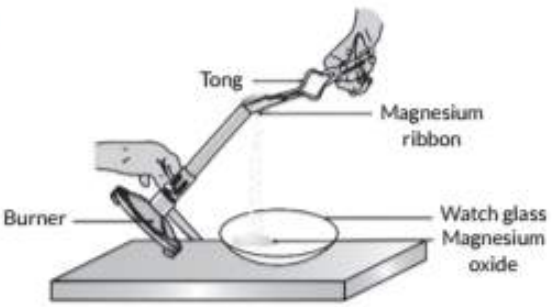
2. Why is it important to balance a skeletal chemical equation?
(a) To verify law of conservation of energy.
(b) To verify the law of constant proportion.
(c) To verify the law of conservation of mass.
(d) To verify the law of conservation of momentum.
(Term I, 2021-22) U

1.2 Types of Chemical Reactions

MCQ

3. In the redox reaction
$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$
(a) MnO_2 is reduced to $MnCl_2$ & HCl is oxidized to H_2O
(b) MnO_2 is reduced to $MnCl_2$ & HCl is oxidized to Cl_2
(c) MnO_2 is oxidized to $MnCl_2$ & HCl is reduced to Cl_2
(d) MnO_2 is oxidized to $MnCl_2$ & HCl is reduced to H_2O *(2022-23)*

4.



Which of the following is the correct observation of the reaction shown in the above set up?
(a) Brown powder of Magnesium oxide is formed.
(b) Colourless gas which turns lime water milky is evolved.
(c) Magnesium ribbon burns with brilliant white light.
(d) Reddish brown gas with a smell of burning Sulphur has evolved. *(2022-23)*

5. **Assertion (A) :** Silver bromide decomposition is used in black and white photography.
Reason (R) : Light provides energy for this exothermic reaction.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true. *(2022-23)* Ap

6. Reema took 5 mL of lead nitrate solution in a beaker and added approximately 4 mL of potassium iodide solution to it. What would she observe?
(a) The solution turned red.
(b) Yellow precipitate was formed.
(c) White precipitate was formed.
(d) The reaction mixture became hot.
(Term I, 2021-22)

7. In the reaction of iron with copper sulphate solution :
$CuSO_4 + Fe \rightarrow Cu + FeSO_4$
Which option in the given table correctly represents the substance oxidised and the reducing agent?

	Substance Oxidized	Reducing Agent
(a)	Fe	Fe
(b)	Fe	$FeSO_4$
(c)	Cu	Fe
(d)	$CuSO_4$	Fe

(Term I, 2021-22) An

8. The chemical reaction between copper and oxygen can be categorized as
(a) displacement reaction
(b) decomposition reaction
(c) combination reaction
(d) double displacement reaction. *(Term I, 2021-22)*

9. Limestone $\xrightarrow[\text{Step 1}]{\text{Heated}} X + CO_2$
$\downarrow +H_2O$ (Step 2)
Slaked lime

Identify the correct option from the given table which represents the type of reactions occurring in step 1 and step 2.

	Endothermic	Exothermic
(a)	×	✓
(b)	✓	×
(c)	✓	✓
(d)	×	×

(Term I, 2021-22) An

10. **Assertion (A) :** Decomposition of vegetable matter into compost is an endothermic reaction.
Reason (R) : Decomposition reaction involves breakdown of a single reactant into simpler products.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true. *(Term I, 2021-22)*

11. **Assertion (A) :** After white washing the walls, a shiny white finish on walls is obtained after two to three days.
Reason (R) : Calcium oxide reacts with carbon dioxide to form calcium hydrogen carbonate which gives shiny white finish.
(a) Both A and R are true, and R is correct explanation of the assertion.
(b) Both A and R are true, but R is not the correct explanation of the assertion.
(c) A is true, but R is false.
(d) A is false, but R is true. *(2020-21)*

VSA (1 mark)

12. List any two observations when ferrous sulphate is heated in a dry test tube. *(2020-21)*

13. Identify the products formed when 1 mL of dil. hydrochloric acid is added to 1 g of sodium metal. *(2020-21)*

SA II (3 marks)

14. (i) (A) + (BC) → (AC) + (B)
(ii) (AB) + (CD) → (AC) + (BD)
Identify the types of reaction mentioned above in (i) and (ii). Give one example for each type in the form of a balanced chemical equation. *(2022-23)* An

15. (a) Which of the following reactions is/are an endothermic reaction(s) where decomposition also happens?
- Respiration
- Heating of lead nitrate
- Decomposition of organic matter
- Electrolysis of acidified water

(b) Silver chloride when kept in the open turns grey. Illustrate this with a balanced chemical equation. *(2020-21)* U