Step Academy official

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STUDENT NAME	
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Paper Type	

Q1. Choose the correct answer. **17X1=17**

1. Which of the followijng best describes a microscopic event in a gas reaction?

(A) Increase in pressure **(B)** Bubbling of gas **(C)** Collision of gas molecules **(D)** Expasion of the gas volume

2. Which statement best describes chemical equilibrium?

(A) All reactions stop completely **(B)** Product formation is complete **(C)** Forward and reverse reactions occur at the same rate **(D)** Only reactants remain

3. Which type of equilibrium involves a change of state?

(A) Chemical **(B)** Physical **(C)** Ionic **(D)** Molecular

4. Which of the following represents a chemical equilibrium?

(A) Ice melting in a glass **(B)** Water vapor condensing on a cold surface **(C)** Nitrogen reacting with hydrogen to form ammonia in a closed container **(D)** Dissolution of salt without any ion exchange

5. The rate of reaction:

(A) Increases as the reaction proceeds **(B)** Decreases as the reaction proceeds **(C)** Remains the same as the reaction proceeds **(D)** May decrease or increase as the reaction proceeds

6. The unit of K_c for the reaction $N_2 + O_2 \rightleftharpoons 2NO$ will be:

(A) Mol dm^{-3} **(B)** $Mol^{-1}dm^{+3}$ **(C)** $Mol^{-2}\ dm^{+6}$ **(D)** No unit

7. For which system does the equilibrium constant, K_c has units of $(concentration)^{-1}$

(A) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ **(B)** $H_2 + I_2 \rightleftharpoons 2HI$ **(C)** $2NO_2 \rightleftharpoons N2O_4$ **(D)** $2HF \rightleftharpoons H_2 + F_2$

8. The unit of equilibrium constant K_c for the reaction $H_2 + I_2 \rightarrow 2HI$ is:

(A) $Mmole^{-1}\ dm^3$ **(B)** $Mole^{-2}\ dm^3$ **(C)** Mole dm^3 **(D)** None

9. The unit of equilibrium constant (K_c) for the reaction $H_2 + 3H_2 \rightleftharpoons 2NH_3\ \Delta H = -92kJmol^{-1}$ will be:

(A) Having no unit **(B)** Mole dm^{-3} **(C)** $Mole^{+2}\ dm^{-6}$ **(D)** $Mole^{-2}\ dm^{+6}$

10. When K_c value is small, the equilibrium position is:

(A) Towards left **(B)** Towards right **(C)** Remains unchanged **(D)** None of these

11. For a reversible reaction if the initial concentration of reactants is doubled, then equilibrium constant. (K_c) becomes

(A) Double **(B)** Decreases one-half **(C)** Remains same **(D)** Decreases to one-fourth

12.

Which of the following reactions will be favoured to the forward direction at low pressure:

(A) $N_2 + O_2 \rightleftharpoons 2NO$ **(B)** $N_2 + 3H_2 \rightleftharpoons 2NH_3$ **(C)** $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ **(D)**

13. When solid KI is dissolved in water its heat of solution is positive. What would happen to dissolution when temperature is increased:

(A) Increases **(B)** Decreases **(C)** Remains same **(D)** First increases then decrease

14. The effect of temperature on equilibrium was studied by:

(A) Lewis **(B)** Van der Waal **(C)** Le Chatelier **(D)** Vant Hoff

15. Formation of NH_3 is an exothermic reaction. Low temperature favours forward reaction. However, in Haber's process temperature used is:

(A) 200 ^oC **(B)** 300 ^oC **(C)** 400 ^oC **(D)** 500 ^oC

16. Which statement about the following equilibrium is correct? $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)} \Delta H = -188.3\ KJ\ mol^{-1}$

(A) The value of K_p falls with a rise in temperature

(B) The value of K_p falls with increasing pressure

(C) Adding a V_2O_5 catalyst increases the equilibrium yield of sulphur trioxide

(D) The value of K_p is equal to K_c

17. The king of chemicals is:

(A) NH_3 **(B)** NO. **(C)** H_2SO_4 **(D)** SO_3

Q2. Write short answers of the following questions. Any 8 **8X2=16**

1 . Why does a reversible reaction not show visible change at equilibrium?

2 . Can a physical equilibrium exist in an open system? Why or why not?

3 . State the Le-Chatelier's principle.

4 . Why ice at 0 ^oC can be melted by applying pressure without supply of heat from outside?

5 . Why does changing the concentration of a substance not alter the value of the equilibrium constant?

6 . How pH and pOH are related with each other?

7 . The sum of pKa and pKb always equal to fourteen at all temperature. Explain.

8 . Write Henderson's equation for an acidic buffer.

9 . Balance the following disproportionation reaction $Br_2 + NaOH \rightarrow NaBr + NaBrO_3 + H_2O$

10 . What is an electrolytic cell?

11 .
Solid sodium chloride does not conduct electricity, but when electric current is passed through molten sodium chloride or its aqueous solution, electrolysis takes place. Give reason.

12 . SHE act as anode when connected with Cu but as cathode when connected with 2n electrode.

Q3. Write short answers of the following questions. Any 8 **8X2=16**

1 . Define oxidation state with two examples.

2 . Calculate the oxidation state of Cr in $K_2Cr_2O_7$ and Cr_2O_3.

3 . Differentiate between ionization and electrolysis.

4 . What is standard hydrogen electrode (SHE)?

5 . A salt bridge maintains the electrical neutrality in the cell.

6 . Why is silicon widely used in photovoltaic cells?

7 . How does light energy cause the generation of electricity in a photovoltaic cell?

8 . Why is nitrogen important for living organisms?

9 . Explain the role of nitrogen in the production of fertilizers.

10 . Why is ammonia important in the agriculture industry?

11 . What type of nitrogen transformation occurs in denitrification?

12 . What is catenation, and how is it related to sulfur?

Q4. Write short answers of the following questions. Any 6 **6X2=12**

1 . Describe the physical states and colors of fluorine, chlorine, bromine, and iodine at room temperature.

2 . Arrange chlorine, bromine, and iodine in order of decreasing volatility. what is the color of chlorine gas at room temperature?

3 . How is hydrogen chloride gas prepared in the lab?

4 . Why is chlorine more effective at low pH during water disinfection?

5 . Why is the troposphere important for life on Earth?

6 . Explain how oxides of sulphur contribute to acid rain. What are the effects of SO_2 on human health?

7 . Mention two harmful effects of hydrocarbon pollution on human health.

8 . How do POPs travel and accumulate in the environment.Give examples of some common POPS.

9 . How is global warming related to the greenhouse effect?

Q5. Write short answers of the following questions. Any 6 **6X4=24**

1 . Mention the characteristics of chemical equilibrium.

2 . Derive Kc expression for the given equation. $N_2 + 3H_2 \rightleftharpoons 2NH_3$

3 . State law of mass action.

4 . Differentiate between oxidation and reduction.

5 . Differentiate between electrolytic cell and voltaic cell.

6 . Write down the structural formula of product formed when 1-butene reacts with Br_2 In CCl_4.

7 . Discuss the properties and uses of sulfur hexafluoride (SF_6), including how it is formed and its industrial application.

8 . Explain why iodine forms a reversible reaction with hydrogen.

9 . Differentiate between primary and secondary air pollutants.

10 . Name four major greenhouse gases