MASTERING CHEMISTRY for HKDSE

BOOK 2

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Fossil Fuels

Choose the best answer for each question.

- 1. Which of the following substance presence in crude oil?
 - A. $C_{12}H_{26}$
 - B. CO
 - $C.\quad C_6H_{12}O_6$
 - D. CH₃COOH
- 2. Crude oil is not used directly because
 - (1) it is a non-renewable resource.
 - (2) it burns with smoky flame.
 - (3) it is difficult to ignite.
 - A. (1) and (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)
- 3. Which of the following combination is correct?

	Fuel	Application		
A.	diesel oil	aircraft		
B.	liquefied petroleum gas	taxi		
C.	petrol	bus		
D.	naphtha	mini-bus		

Alkane and Alkene

Choose the best answer for each question.

- 1. The general formula of alkane is
 - $A.\quad C_nH_{2n-1}$
 - $B.\quad C_nH_{2n+1}$
 - $C.\quad C_nH_{2n-2}$
 - $D.\quad C_nH_{2n}$
- 2. The functional group of alkene is
 - A. C–C
 - B. C=C
 - C. C≡C
 - D. C-H
- 3. Which of the following is the first member of alkene?
 - A. CH₂
 - B. CH₄
 - $C.\quad C_2H_2$
 - $D.\quad C_2H_4$
- 4. Under room temperature and pressure, which of the following organic compounds exist in gaseous state?
 - A. propane
 - B. propan-1-ol
 - C. ethanoic acid
 - D. ethyl ethanoate

Electrolysis

Choose the best answer for each question.

- **1.** Using graphite as the cathode, which of the following solutions would give hydrogen gas upon electrolysis?
 - (1) 1.0 M sodium chloride solution
 - (2) 1.5 M potassium hydroxide solution
 - (3) 2.0 M silver nitrate solution
 - A. (1) and (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)
- **2.** A student tries to electroplate a copper ring with silver in the school laboratory as shown below:



Which of the following combination is correct?

	Anode	Cathode	Solution X		
A.	silver	copper ring	copper(II) sulphate solution		
B.	copper ring	silver	copper(II) sulphate solution		
C.	silver	copper ring	silver nitrate solution		
D.	copper ring	silver	silver nitrate solution		

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Chemical Reactions and Energy

Choose the best answer for each question.

- 1. In which of the following enthalpy change of reactions can be determined by direct method?
 - (1) $\text{HCl}_{(aq)} + \text{NaOH}_{(aq)} \rightarrow \text{NaCl}_{(aq)} + \text{H}_2\text{O}_{(l)}$
 - (2) $C_2H_{4(g)} + Cl_{2(g)} \rightarrow CH_2ClCH_2Cl$
 - (3) $CH_3CH_2OH_{(l)} + 3O_{2(g)} \rightarrow 2CO_{2(g)} + 3H_2O_{(l)}$
 - A. (1) and (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)
- **2.** In which of the following enthalpy change of reactions should be determined by indirect method?
 - (1) $CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$
 - (2) $C_{(s)} + 2H_{2(g)} \rightarrow CH_{4(g)}$
 - (3) $\operatorname{Cu}_{(s)} + \operatorname{S}_{(s)} + \frac{9}{2}\operatorname{O}_{2(g)} + 5\operatorname{H}_{2(g)} \rightarrow \operatorname{CuSO}_4 \bullet 5\operatorname{H}_2\operatorname{O}_{(l)}$
 - A. (1) and (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)

Mock Exam

This section consists of two parts. There are 24 questions in **PART I** and 12 questions in **PART II**. Choose the best answer for each question. Candidates may refer to the Periodic Table printed on the last page of the book.

PART I

- 1. Element Z occurs in nature in two isotopes, ${}^{35}Z$ and ${}^{37}Z$. The relative atomic mass of Z is 35.5. What is the relative abundance of the isotope ${}^{37}Z$?
 - A. 25%
 - B. 45%
 - C. 55%
 - D. 75%
- 2. Which of the following molecules is non-polar?
 - A. NH₃
 - B. OF₂
 - C. SiH₄
 - D. SO₂
- 3. Consider the following chemical equation:

 $x \operatorname{Mn}^{2^+}_{(aq)} + \operatorname{O}_{2(g)} + y \operatorname{OH}^-_{(aq)} + z \operatorname{H}_2 \operatorname{O}_{(l)} \rightarrow x \operatorname{Mn}(\operatorname{OH})_{3(s)}$

Which of the following combination is correct?

	\underline{x}	<u>y</u>	Z
A.	2	4	2
B.	2	8	2
C.	4	8	2
D.	4	5	3

ANSWERS

Topic 13 – Fossil Fuels

1. A

 $C_{12}H_{26}$ is alkane, which is presence in crude oil.

- 2. C
- 3. B
- 4. A

Local town gas is manufactured by naphtha.

- 5. D
- 6. B
- 7. D
- 8. C
- 9. A

The members have the same general formula.

10. C

11. A

Topic 15 – Alkane and Alkene

1. D

2. B

3. D

Since alkene has C=C functional group, it has at least two carbon atoms in the molecule.

 $C_{n}H_{2n}, n = 2$

 C_2H_4 is the first member of alkene.

4. A

 $C_1 - C_4$ alkane exist as gaseous state under room temperature and pressure.

5. B

 $\mathrm{CH}_{4(g)} \ + \ 2\mathrm{O}_{2(g)} \ \rightarrow \ \mathrm{CO}_{2(g)} \ + \ 2\mathrm{H}_2\mathrm{O}_{(l)}$

No. of moles of $CO_{2(g)}$ formed = No. of moles of $CH_{4(g)}$ burned

No. of moles of $CO_{2(g)}$ formed = 1 mole

6. B

(1) CH₄ + 2O₂ \rightarrow CO₂ + 2H₂O

The mole ratio of CO_2 and H_2O is 1:2.

(2) $C_2H_6 + \frac{7}{2}O_2 \rightarrow 2CO_2 + 3H_2O_2$

The mole ratio of CO_2 and H_2O is 2:3.

(3) $C_3H_6 + \frac{9}{2}O_2 \rightarrow 3CO_2 + 3H_2O_2$

The mole ratio of CO_2 and H_2O is 1:1.

Topic 19 – Electrolysis

1. A

In (1) and (2), $H^{+}_{(aq)}$ is preferentially discharged since it is stronger oxidizing agent than Na⁺_(aq) and K⁺_(aq).

 $2\mathrm{H}^{+}_{(aq)} + 2e^{-} \rightarrow \mathrm{H}_{2(q)}$

In (3), $Ag^{+}_{(aq)}$ is preferentially discharged since it is stronger oxidizing agent than $H^{+}_{(aq)}$.

 $\operatorname{Ag}_{(aq)}^{+} + e^{-} \rightarrow \operatorname{Ag}_{(s)}$

2. C

In electroplating, the object (copper ring) should be placed at the cathode and the metal (silver) should be placed at the anode. The solution should contain the mobile ions of silver.

Anode: $Ag_{(s)} \rightarrow Ag^{+}_{(aq)} + e^{-}$ Cathode: $Ag^{+}_{(aq)} + e^{-} \rightarrow Ag_{(s)}$

3. B

Iron key (cathode) should be connected to the negative terminal of the battery.

 $\mathrm{Ni}^{2^+}_{(aq)} + 2e^- \rightarrow \mathrm{Ni}_{(s)}$

4. B

(1) is not correct since $PbBr_{2(s)}$ is insoluble in water.

(3) is not correct since $CH_3CH_2OH_{(l)}$ cannot conduct electricity.

Topic 21 – Chemical Reactions and Energy

- 1. B
- 2. C
- 3. C

 $Fe_{\scriptscriptstyle (s)}$ should undergoes complete combustion to give $Fe_2O_{\scriptscriptstyle 3(s)}.$

4. C

The conversion will not occur spontaneously under normal conditions is due to the reaction is kinetically stable (with very high activation energy).

5. A

6. A

$$\Delta H^{\ominus} = \sum \Delta H^{\ominus}{}_{f} [Products] - \sum \Delta H^{\ominus}{}_{f} [Reactants]$$
$$= -137 - [52 + (-92.3)]$$
$$= -96.7 \text{ kJ mol}^{-1}$$

7. D

$$3C_{(s)} + 4H_{2(g)} + \frac{1}{2}O_{2(g)} \xrightarrow{\Delta H^{\Theta}_{f}[CH_{i}CH_{i}CH_{i}CH_{i}CH_{i}OH_{(g)}]} CH_{3}CH_{2}CH_{2}OH_{(l)}$$

$$\downarrow + 3O_{2(g)} + \frac{3}{2}O_{2(g)} + \frac{4\Delta H^{\Theta}_{f}[H_{2}O_{(l)}]}{\Delta H^{\Theta}_{f}[CO_{2(g)}]} \xrightarrow{\Delta H^{\Theta}_{f}[CO_{2(g)}]} + 4\Delta H^{\Theta}_{f}[H_{2}O_{(l)}] \xrightarrow{\Delta H^{\Theta}_{c}[CH_{3}CH_{2}CH_{2}OH_{(l)}]}$$

$$3CO_{2(g)} + 4H_{2}O_{(l)}$$

$$\Delta H^{\Theta}_{f}[CH_{3}CH_{2}CH_{2}OH_{(l)}] = 3\Delta H^{\Theta}_{f}[CO_{2(g)}] + 4\Delta H^{\Theta}_{f}[H_{2}O_{(g)}] - \Delta H^{\Theta}_{c}[CH_{3}CH_{2}CH_{2}OH_{(l)}]$$

$$= 3(-394) + 4(-286) - (-2021)$$

$$= -305 \text{ kJ mol}^{-1}$$

Mock Exam

1. A	6. B	11. B	16. D	21. A	26. B	31. C	36. B
2. C	7. D	12. C	17. B	22. C	27. B	32. A	
3. C	8. B	13. A	18. D	23. B	28. C	33. C	
4. D	9. C	14. D	19. D	24. D	29. C	34. B	
5. A	10. B	15. C	20. A	25. A	30. D	35. C	

1. Let the relative abundance of ${}^{37}\mathbf{Z}$ be x

$$37x + 35(1 - x) = 35.5$$

 $x = 0.25 (25\%)$



4. HBr, SO_2 and PCl_3 are simple molecular substances.

KI is giant ionic compound.

Giant ionic compound has higher melting point than simple molecular substance.

- Ionic bond is formed by cation and anion. Example: NaCl, NH₄NO₃
- 6. $SO_{3}^{2^{-}}(aq)$ is a common reducing agent, it can oxidized by $K_2Cr_2O_7 / H^{+}_{(aq)}$.
- 7. X is the anode.

 $Mg_{(s)} \rightarrow Mg^{2+}_{(aq)} + 2e^{-}$

Z is the cathode.

$$\operatorname{Cu}_{(aq)}^{2^+} + 2e^- \rightarrow \operatorname{Cu}_{(s)}$$



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About the Author

Mr. Alan Cheng is a renowned Chemistry teacher in Hong Kong. He has been teaching senior-form Chemistry for 15 years in a highly esteemed educational institution with great success. With his distinguished tenacity in teaching Chemistry for public examination and assessment, he has prepared a vast amount of quality exam-oriented notes, exercise books and mock exam papers to help local students in their public examinations.

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