黎 sir 教室 A Lai Learning Center
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2016 HKDSE Chemistry Paper 1A

Suggested Solutions

Prepared by Andy Lai

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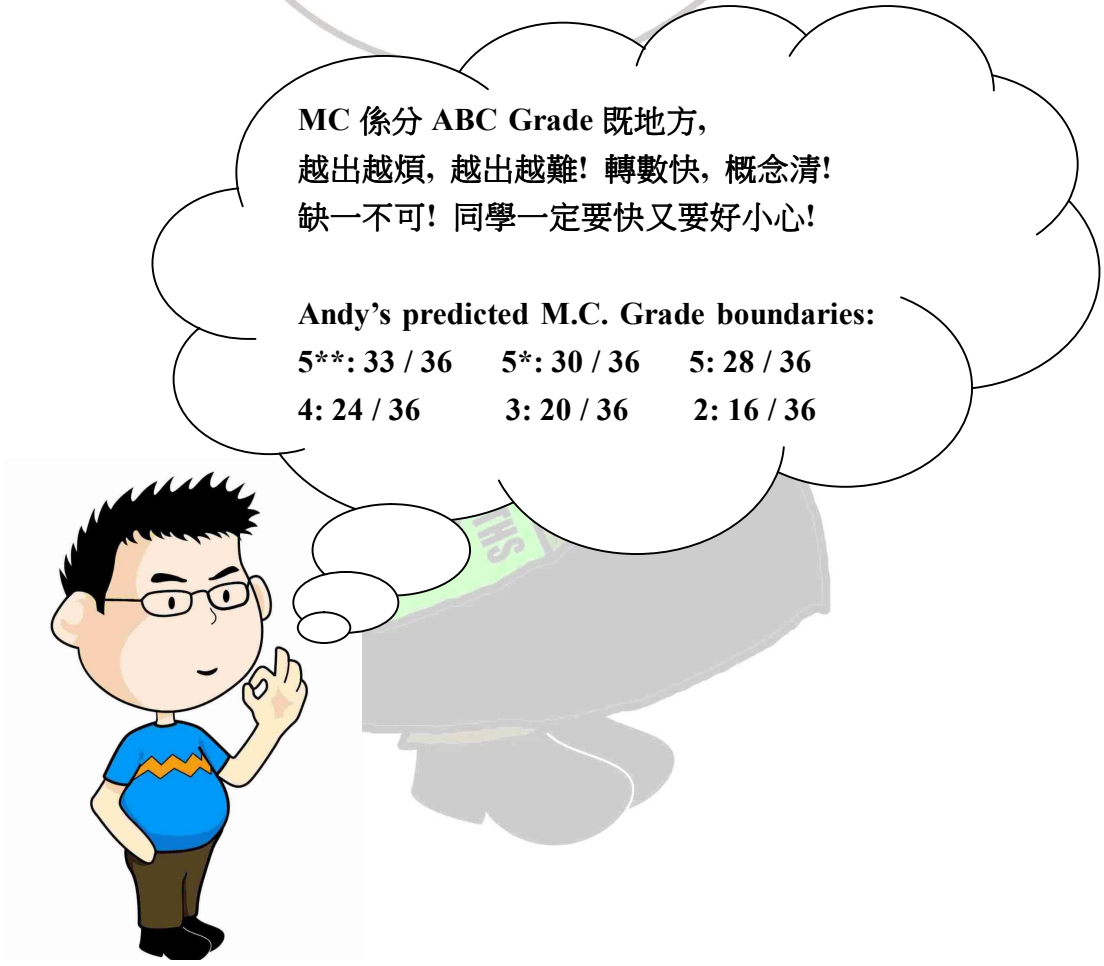
2016 HKDSE Chemistry Paper 1A Suggested Answers

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



Part I

1. A

黎 Sir 提提你 :

- **Flame Test results: Brick-red flame ⇒ Calcium ions present**
- **Chalk is mainly composed of calcium carbonate ⇒ Brick red flame!**
- **Quartz is mainly composed of silicon dioxide**
- **Graphite is mainly composed of carbon.**
- **Rock salts is mainly composed of sodium chloride ⇒ Golden yellow!**

2. C

黎 Sir 提提你 :

- **Lithium is metal while sulphide is non-metal ⇒ Ionic compound!**
- **Lithium is group 1 metal ⇒ lose 1 electron!**
- **Sulphur is group 6 non-metal ⇒ gain 2 electrons!**
- **Therefore, 2 lithium atoms will lose 1 electron respectively and 1 sulphur atom will gain 2 electrons from 2 lithium atoms.**

3. D

黎 Sir 提提你 :

- **Sliver will not reacts with water.**
- **Y_2O ⇒ Y^{1+} and O^{2-} ⇒ Y cannot be strontium which is group 2 metal.**
- **Atom of Y have 5 occupied electron shells**
  ⇒ Y is period 5 element
  ⇒ Rubidium is the only possible answer!

4.	**C**	**黎 Sir 提提你 :** • **Moist glass wool is heated occasionally ⇒ Water vapour evolves!** • **X is heated strongly when water vapour passing through** **⇒ Only metals with position in reactivity series higher than lead would be the possible choice** **⇒ Therefore, X cannot be copper**

5.	**B**	**黎 Sir 提提你 :** • **Tin plating is a tin layer is coated on the surface of iron can** **⇒ The layer prevents iron from exposure to air and water** **⇒ Without exposing to air and water, Iron rusting is prevented.** • **Tin is less reactive than iron** **⇒ Tin cannot provide sacrificial protection to iron.** • **Tin plating is a tin layer is coated on the surface of iron can, not alloying.**

6.	**B**	**黎 Sir 提提你 :** • **pH value =** $-\log[H+]$ **⇒ 2.6 =** $-\log[H+]$ **⇒** $[H+] \approx 2.51188... \times 10^{-3}$ **M** • **New** $[H+] \approx \dfrac{(2.51188... \times 10^{-3})(0.1)}{0.2} = 1.25594... \times 10^{-3}$ **M** **⇒ New pH value =** $-\log(1.25594... \times 10^{-3}) = 2.9$

7.	A	黎 Sir 提提你 : • Oxalic acid powder dissolve in water to ionize hydrogen ions ⇒ Acidic properties shows only and no gas will be evolved. • Ionic equation for the reaction: $Zn + 2H^+ \rightarrow Zn^{2+} + H_2$ ⇒ Hydrogen (colourless) gas evolves! • Zinc will have no reaction with water!

8.	A	黎 Sir 提提你 : • $CuO_{(s)} + H_2SO_{4(aq)} \rightarrow CuSO_{4(aq)} + H_2O_{(l)}$ ⇒ Excess solid copper(II) oxide make sure all the sulphuric acid is reacted! ⇒ Filter off excess solid copper(II) oxide ⇒ Crystallization ⇒ Copper sulphate crystal will be formed! • $CuO_{(s)} + MgSO_{4(aq)} \rightarrow CuSO_{4(aq)} + MgO_{(aq)}$ ⇒ Both $CuSO_{4(aq)} + MgO_{(aq)}$ are soluble in water • Copper has no reaction with dilute sulphuric acid, only react with concentrated sulphuric acid to form copper sulphate and sulphur dioxide. • Copper does not have reaction with magnesium sulphate since the reactivity of copper is lower than that of magnesium.

9.	**C**	**黎 Sir 提提你 :** • **Hydrocarbon undergoes complete combustion** **⇒ H_2O and CO_2 are the only products** • **Only $C_6H_{12}+9O_2 \rightarrow 6CO_2+6H_2O$ is the possible to fulfill the requirement of 1 mole of hydrocarbon reacts with 9 moles oxygen.**

10.	**B**	**黎 Sir 提提你 :** • **Catalytic converter:** **⇒ $NO/NO_2 \rightarrow N_2$, $CO \rightarrow CO_2$, Unbrunt hydrogencarbon ⇒ H_2O+CO_2** • **Sulphur dioxide have to use scrubber to clear out**

11.	**A**	**黎 Sir 提提你 :** • **Oxidation of N in NF_3 = +3** • **Oxidation of N in N_2H_4 = -2** • **Oxidation of N in $NaNH_2$ = -3** • **Oxidation of N in $HONH_2$ = -1**

12.	**B**	**黎 Sir 提提你 :** • **Negative pole of the battery ⇒ Electrons flow out of the negative pole!** • **Positive pole of the battery ⇒ Electrons flows into the positive pole!** • **Current flow in the clockwise direction!** • **Iron Rod IV (Cathode):** $2H^+ + 2e \rightarrow H_2$ • **Iron Rod II: (Cathode):** $Cu^{2+} + 2e \rightarrow Cu$

13.	**C**	**黎 Sir 提提你 :** • $Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$ **⇒ Solution Y turns from Greenish-yellow to brown** • $12FeSO_4 + 3O_2 \rightarrow 4Fe_2(SO_4)_3 + 2Fe_2O_3$ **⇒ Solution Y turns from green to yellow.** • $Cr_2O_7^{2-} + 2H^+ + 3SO_2 \rightarrow 3SO_4^{2-} + 2Cr^{3+} + H_2O$ **⇒ Solution Y turns from orange to green.** • **No reaction between carbon dioxide and acidified potassium permanganate**

14.	**D**	**黎 Sir 提提你 :** • $2AgBr \rightarrow 2Ag + Br_2$ ⇒ **Changes of oxidation number of Ag: +1 → 0 (Reduction)** ⇒ **Changes of oxidation number of Br: -1 → 0 (Oxidation)** • $SO_2 + 2H_2S \rightarrow 3S + 2H_2O$ ⇒ **Changes of oxidation number of S: +4 → 0 (Reduction)** ⇒ **Changes of oxidation number of S: -2 → 0 (Oxidation)** ⇒ **Disproportionation reaction! (Self-redox!)** • $2KClO_3 \rightarrow 2KCl + 3O_2$ ⇒ **Changes of oxidation number of Cl: +5 → -1 (Reduction)** ⇒ **Changes of oxidation number of O: -2 → 0 (Oxidation)** • $Ca(HCO_3)_2 \rightarrow CaCO_3 + H_2O + CO_2$ ⇒ **Changes of oxidation number of C: +4 → +4** ⇒ **Changes of oxidation number of Ca: +2 → +2** ⇒ **Changes of oxidation number of H: +1 → +1** ⇒ **Changes of oxidation number of O: -2 → -2** ⇒ **It is not a redox reaction!**

15.	**B**	**黎 Sir 提提你 :** • **When the secondary cell is discharging** ⇒ **Negative electrode will lose electrons and so oxidation occurs** ⇒ $Cd + 2OH^- \rightarrow Cd(OH)_2 + 2e$ • **When the cell is being recharging** ⇒ **Negative electrode will gain electrons and so reduction occurs** ⇒ $Cd(OH)_2 + 2e \rightarrow Cd + 2OH^-$

16.	**A**	**黎 Sir 提提你 :** • **There are hydrogen bonds, dipole moments and van der waal's force between between HF molecules, its boiling point should be the highest.** • **Others only have dipole moment and van der waal's force.**

17.	**C**	**黎 Sir 提提你 :** • **Petroleum = Mixture of alkanes** • **Aliphatic hydrocarbons = Hydrocarbon with linear chains** • **Different fractions with different boiling points** $\Rightarrow$ **Fractional distillation of petroleum can be used to separate them** $\Rightarrow$ **Different fractions cannot be separated by different viscosity** • **Fossil fuel is derived from ancient marine organism. After they died, under high pressure and temperature, the fossil will become fossil fuels.**

18.	**A**	**黎 Sir 提提你 :** • **Vinegar = Mixture of ethanoic acid and water** • **Ethanoic acid is weak acid** $\Rightarrow$ $CH_3COOH \Leftrightarrow CH_3COO^- + H^+$ • **Sugar does not have OH^- and so it is not basic is nature.** $\Rightarrow$ **Neutralization can only occur: Acid + Base $\rightarrow$ Salts + Water** • **pH value of vinegar is about 2 – 3 $\Rightarrow$ pH value = 1 is too acid.**

19.	**C**	**黎 Sir 提提你 :** •  ⇒ **Hazard warning label: Corrosive** ⇒ **Sodium and Concentrated aqueous ammonia is corrosive!** •  ⇒ **Hazard warning label: Toxic** ⇒ **Trichloromethane is toxic!**

20.	**D**	**黎 Sir 提提你 :** • $Pb^{2+} + 2e \rightarrow Pb$ ⇒ **Lead(II) ions gain electrons** ⇒ **Reduction!** • $Pb^{2+} + 2e \rightarrow Pb$ ⇒ **Lead(II) ions gain electrons** ⇒ **No change in numbers of protons** • **Pb is group 4 element** ⇒ **Four outermost shells electrons** ⇒ $Pb \rightarrow Pb^{2+} + 2e$ ⇒ Pb^{2+} **still have 2 electrons in the outermost shell** ⇒ Pb **and** Pb^{2+} **have the same number of occupied electron shells**

21.	**C**	**黎 Sir 提提你 :** • BCl_3 ⇒ **3 bond pairs** ⇒ **Trigonal planer** • NH_3 ⇒ **3 bond pairs + 1 lone pair** ⇒ **Trigonol pyraimid** • PF_3 ⇒ **3 bond pairs + 1 lone pair** ⇒ **Trigonol pyraimid**

22.	**D**	**黎 Sir 提提你 :** • $CaO + H_2O \rightarrow Ca(OH)_2$, $\Delta H = -ve$ $\Rightarrow$ **Exothermic** • $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$, $\Delta H = -ve$ $\Rightarrow$ **Exothermic** • $HCl + NaOH \rightarrow NaCl + H_2O$, $\Delta H = -ve$ $\Rightarrow$ **Exothermic** • **Remarks: You have to remember some examples of exothermic reaction and endothermic reaction.**

23.	**C**	**黎 Sir 提提你 :** • **During Anodisation** $\Rightarrow$ **Aluminium is used as anode** $\Rightarrow$ **Oxide ions are oxidized to give oxygen** $\Rightarrow$ $4Al + 3O_2 \rightarrow 2Al_2O_3$ $\Rightarrow$ **Oxide layer is formed on the aluminium surface**

24.	**D**	**黎 Sir 提提你 :** • **The standard enthalpy change of formation of a compound can be either positive or negative, depending on whether the reactants or products are more stable. For example,** $\Delta H_f^{\theta}[NO_2] = +33.18\ kJ/mol$

Part II

25. C

黎 Sir 提提你 :

- $Mg + 2HCl \rightarrow MgCl_2 + H_2$
- **Number of moles of HCl = 1 x 0.02 = 0.02 moles**
- $\frac{1}{2} = \frac{x}{0.02} \Rightarrow x = 0.01\ moles$ ⇒ **0.03 – 0.01 = 0.02 moles ⇒ Mg is in excess!**
- **0.02 moles HCl reacts with 0.01 moles Mg gives 0.01 moles H_2**
- **The initial rate of the reaction is the fastest, then it decreases gradually and finally stops.**

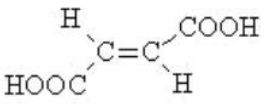
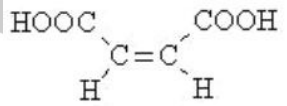
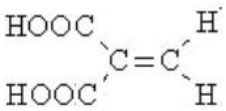
26. B

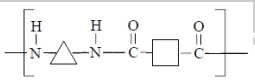
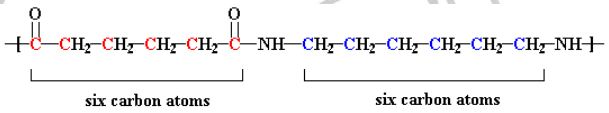
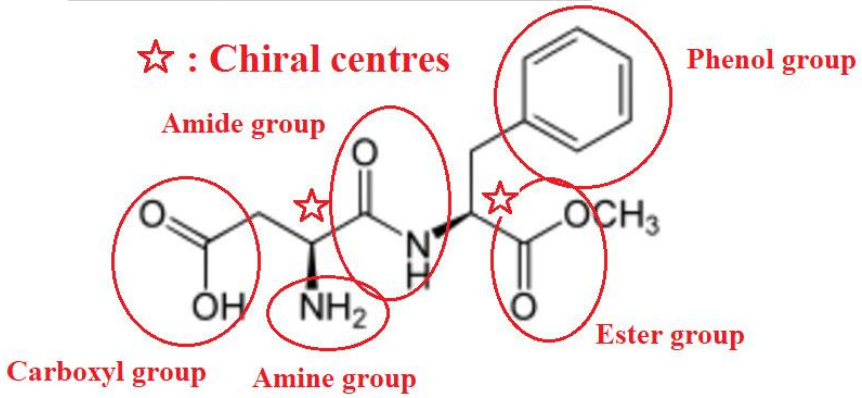
黎 Sir 提提你 :

- ↑ **Temperature ⇒** ↑ **Both forward and backward rates of reaction**
- ↑ **Temperature ⇒** ↑ **Kinetic energy of molecules**
  ⇒ ↑ **Speed of the molecules**
  ⇒ ↑ **Forces on the wall by molecules during collision**
  ⇒ ↑ **Gas pressure of the system**
- ↑ **Temperature**
  ⇒ ↓ **Equilibrium constant since forward reaction is exothermic**
- ↑ **Temperature**
  ⇒ ↓ **Equilibrium position shift to left since forward reaction is exothermic**
  ⇒ ↓ **yields of CO_2 and H_2 to the same extent.**

27.	**D**	**黎 Sir 提提你 :** • $Br_2 + H_2O \Leftrightarrow HOBr + H^+ + Br^-$ • **The colour of the system turn paler ⇔ Equilibrium shifts right!** • $\uparrow HCl_{(g)} \Rightarrow \uparrow [H^+_{(aq)}] \Rightarrow$ **Equilibrium shift left** • $\uparrow HBr_{(g)} \Rightarrow \uparrow [H^+_{(aq)}]$ **and** $\uparrow [Br^-_{(aq)}] \Rightarrow$ **Equilibrium shift left** • $\uparrow NaBr_{(s)} \Rightarrow \uparrow [Br^-_{(aq)}] \Rightarrow$ **Equilibrium shift left** • $\uparrow NaOH_{(aq)} \Rightarrow OH^-_{(aq)} + H^+_{(aq)} \Leftrightarrow H_2O \Rightarrow$ **Equilibrium shift right!**

28.	**C**	**黎 Sir 提提你 :** • **But-1-ene ⇒ Functional group: Alkene** • **Butan-1-ol ⇒ Functional group: Alcohol** • **Decolourise acidified $KMnO_{4(aq)}$: Alkene and Alcohol** • **Reaction with $PBr_{3(l)}$: Alcohol but Not Alkene** • **Heating Butan-1-ol with Al_2O_3 ⇒ But-1-ene can be obtained**

29.	**C**	**黎 Sir 提提你 :** • **Molecular formula: $C_4H_4O_4$ and with COOH group x 2** • **There are 3 possible isomers as follows:**  **Trans-butenedioic acid (Fumaric acid)**  **Cis-butenedioic acid (Maleic acid)**  **propendioic acid**
30.	**D**	**黎 Sir 提提你 :** • **Base Strength of metal oxide:** $Na_2O > MgO > Al_2O_3$ $\Rightarrow$ Na_2O **and** MgO **basic oxide while** Al_2O_3 **is amphoteric oxide.** $\Rightarrow$ $Na_2O + 2H_2O \rightarrow 2NaOH + H_2O$ **while** $MgO + H_2O \rightarrow Mg(OH)_2$ • **Melting point of metal: Al > Mg > Na** • **Electronegativity of metal: Al > Mg > Na** • **Reactivity of metal with water: Na > Mg > Al**

31.	**A**	**黎 Sir 提提你 :** • **Nylon-6,6 is used to make ropes.** • **The polymerization in forming nylon-6,6 is a condensation process.** • **The repeating unit is**  **while the square block is $(CH_2)_4$ and the triangular block is $(CH_2)_6$.**  **Repeating unit of Nylon-6,6** • **Remarks: Form this multiple choice question, you see how hard HKDSE chemistry examination is! Candidates have to understand thoroughly the concepts of different parts of the syllabus! Again, No Pains, No Gains!**
32.	**B**	**黎 Sir 提提你 :** • **Please refer to the diagram below:**  **Functional group of Aspartame** • **Therefore, Aspartame has 2 chiral centres, 1 carboxyl group, 1 amide group, 1 amine and 1 phenol group.**

33.	D	黎 Sir 提提你 : • HCl is strong acid which ionizes completely in water while CH_3COOH is weak acid which ionizes partly in water. Therefore, extra energy is needed to ionizes CH_3COOH molecules to reacts with magnesium oxide. The rate of reaction is slower. • The surface area of powdered marbles are larger than that of granular marbles. Therefore, the contact surface area is larger, the rate of reaction is faster. • MnO_2 is a catalyst of the decomposition of H_2O_2. Without catalyst, the reaction will be very slow ad stopped.

34.	B	黎 Sir 提提你 : • Since Carbon dioxide which is gases is formed in the reaction, by measuring the volume of the gas formed in a period of time, the progress or the rate of the reaction can be followed. • Bromine reactants are brown in colour in the solution while Bromide ions is colourless products. Therefore, by measuring the changes in the colour intensity of the reaction mixture in a period of time, the progress of the reaction can be followed. • The turbidity of the reaction mixture cannot be measured since there no precipitates formed in the products, the changes of the turbidity is not significant.

35.	**A**	**黎 Sir 提提你 :** • **Soap = Soapy detergents, which can be made from vegetable fats.** • **Soap can emulsify the fats into oil droplets. Each oil droplets is negatively charged and so upon shaking, they repel each other and so cannot come and join together again. Therefore, the oil-water emulsion is stabilized by the soap.** • **Soap can reduce the surface tension of water, which makes the water particles spread out easily and wets the surface more thoroughly.**

36.	**A**	**黎 Sir 提提你 :** • $P_4O_{10} + 6H_2O \Leftrightarrow 4H_3PO_4$ ⇒ **Phosphoric acid is weak acid** ⇒ P_4O_{10} **is acidic oxide** ⇒ $P_4O_{10} + 12NaOH \rightarrow 4Na_3(PO_4) + 6H_2O$ ⇒ **Neutralization!**

The end.

黎 Sir 簡介 Andy Lai BEng CUHK, MIEEE

Mathematics
Economics
Physics

- ✧ 畢業於香港中文大學電子工程學系，黎 Sir 教室創辦人之一.
- ✧ 超過 15 年教授中學文憑 / IB Diploma / GCE / HSC / SAT / AP / GCSE / IGCSE / IB MYP 課程經驗.
- ✧ 與學生面對新中學文憑試,黎 Sir 親身上陣,以實力於數學科,物理科和經濟科奪取 5**,證明寶刀未老.
- ✧ 熟悉出題趨勢，教授考試取分技巧；鼓勵同學獨立思考，增強同學理解能力.
- ✧ 善用生活化例子講解，教法生動，增加學習趣味；深入淺出，明白學生學習上的困難和需要.
- ✧ 精心編制筆記，適合中文和英文中學學生就讀；精心編制練習和試題，協助同學盡快掌握答題技巧.
- ✧ 黎 Sir 在中學和大學時代已是一名傑出學生，曾獲取的多項學業上和運動上的獎學金及獎項.
- ✧ 曾代表香港參加國際性運動比賽，取得優異成績，又讀得又玩得，絕不是死讀書的書呆子.
- ✧ 任教科目：所有數學科，物理科，化學科，生物科，經濟科，商業科.

黎 Sir 教室學生佳績：

Excellent Results

- ✧ 首屆香港中學文憑 (HKDSE)，多位學生取得 5/5*/5**級以上佳績. 更有學生考獲 5 科 5**級 2 科 5*級 1 科 5 級優異成績，在全港 72620 考生中，排名 28，入讀港大醫學院.
- ✧ 英國高考 (GCE AS/AL)，多位學生取得 A*/A 最高級別，更有學生考獲 5 科 A*.
- ✧ 國際文憑 (IB Diploma)，多位學生取得 6 / 7 級別，更有學生取得 44/45 總分.
- ✧ 英國會考 (IGCSE / GCSE)，多位學生取得 A / A*成績，更有學生取得 8 科 A*。
- ✧ 加拿大大學預科 (CESI) 數學課程 MCV4U，取得 98 / 100, 99 / 100 成績。
- ✧ 學生成功拔尖 (EAS)，提早入讀港大理學院和中大法律學院.
- ✧ 香港中學會考 (HKCEE)，多位學生取得 20 分以上佳績.
- ✧ 保加利亞國際數學競賽 (BIMC 2013) 隊際賽金牌.
- ✧ 奧數華夏杯/港澳杯/華杯，多位學生取得特等獎/金獎/一等獎/全港第二名.
- ✧ 還有更多，怒不能盡錄，詳情請瀏覽以下網址: www.andylai.hk/result.htm

黎 Sir 教室課程特色：

- ✧ 小組教學 (1 – 6 人)，導師親身教學；照顧每位學生需要，事半功倍.
- ✧ 精心編制筆記，練習以近 30 年本地和外國公開試題為藍本.
- ✧ 概念理解，取分技巧並重；協助同學盡快掌握答題技巧.
- ✧ 歡迎自由組合小組上課，時間及課程內容編排更有彈性.
- ✧ 詳情請瀏覽以下網址: www.andylai.hk

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資深中學補習導師 小組補習 事半功倍!!!

黎 Sir 簡介 *Andy Lai* BEng CUHK, MIEEE

5 Mathematics 5
Economics 5
Physics 5

- ✧ 畢業於香港中文大學, 黎 Sir 教室創辦人之一.
- ✧ 超過 16 年教授 中學文憑 / IB Diploma / GCE / HSC / SAT / AP / GCSE / IGCSE / IB MYP 課程經驗.
- ✧ 與學生面對新中學文憑試,黎 Sir 親身上陣,於數學科,物理科和經濟科奪取 5**,證明寶刀未老.
- ✧ 現於黎 Sir 教室任教補習班, 學生就讀於英文中學, 中文中學, 國際學校及英國留學生.
- ✧ 熟悉近年出題趨勢, 教授考試取分技巧; 鼓勵同學獨立思考, 增強同學理解能力.
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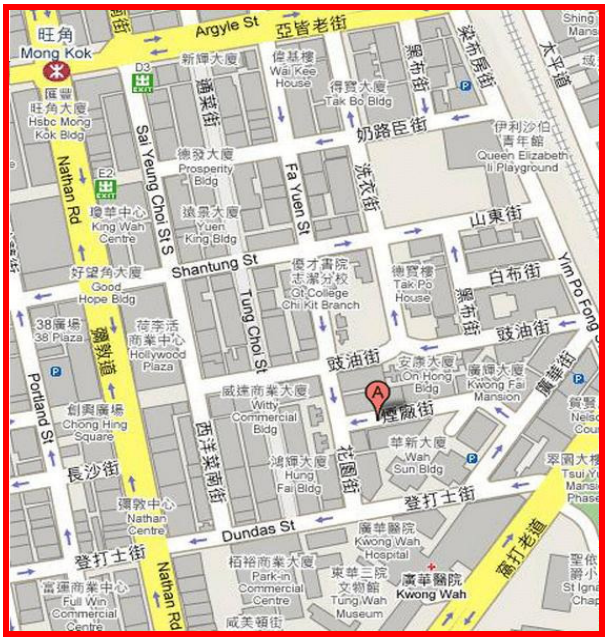
- ✧ 黎 Sir 在中學和大學時代已是一名傑出學生, 曾獲取多項學業上和運動上的獎學金及獎項; 曾代表香港參加國際性運動比賽, 取得優異成績, 「又讀得又玩得」, 絕不是死讀書的書呆子.
- ✧ 黎 Sir 在就讀大學時曾於全球最大美資電腦公司任實習生超過一年, 大學畢業後旋即於全港大型英資電腦公司, 負責主理該公司所代理的全球大型美資電腦公司儲存系統銷售業務.
- ✧ 於短短半年內將該產品線銷售業績提升超過 50%. 同時更被公司評選為"傑出表現員工 Outstanding Performer", 成功將書本上的知識靈活運用於工作上.
- ✧ 黎 Sir 為了教學理想, 毅然辭去工作, 全身投入教學事業, 希望將自己的一套學習方法教授學生.

黎 Sir 教室 課程特色

- ✧ 小組教學 (1 – 6 人), 導師親身教學; 照顧每位學生需要, 事半功倍.
- ✧ 精心編制筆記, 練習以近 30 年本地和外國公開試題為藍本.
- ✧ 概念理解, 取分技巧並重; 協助同學盡快掌握答題技巧.
- ✧ 歡迎自由組合小組上課, 時間及課程內容編排更有彈性.
- ✧ 時間及課程請瀏覽以下網址: www.andylai.hk



地鐵: 旺角 E2 出口, 油麻地 A2 出口

小巴: 1, 1A, 2, 3C, 6, 6C, 6F, 9, 30X, 35A, 41A, 42A, 60X, 63X, 68X, 69X, 81S, 87D, 93K, 95, 104, 117, 203, 212, 230X, 234P, 234X, 238P, 238S, 259B, 270P, 281A

小巴: 21K, 74, 74S

黎Sir教室 A Lai Learning Center

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