Hong Kong Examinations and Assessment Authority & Curriculum Development Institute, EDB
Teachers' Meeting for A/AS-Level Physics TAS & HKDSE Physics SBA

Date : 6th November, 2010 (Saturday)
Time : 9:05 a.m. to 10:25 a.m. / 11:00 a.m. to 12:20 p.m.
Venue : Lung Kong WFSL Lau Wong Fat Secondary School

Programme :

Time	Events
9:05 a.m. – 9:30 a.m.	A/AS-Level TAS and HKDSE SBA arrangement
11:00 a.m. – 11:25 a.m.	(**Mr SZETO Yuk Tong** – Manager-Assessment Development, HKEAA)
9:30 a.m. – 10:10 a.m.	Experience sharing
11:25 a.m. – 12:05 p.m.	1. Planning of SBA in HKDSE
	(**Mr LAW Man Wai** – PLK 1983 Board of Directors' College)
	2. Using MVA in SBA
	(**Mr WONG Bing Sze** –Chan Shu Kui Memorial School)
10:10 a.m. – 10:25 a.m.	Supervisors' remarks
12:05 p.m. – 12:20 p.m.	(**Dr LAU Yiu Hon** – Co-Supervisor of TAS/SBA)

List of Documents
1. HKDSE SBA Arrangement
2. 2010 A/AS Physics Practical Examination (Paper 4)
3. List of suggested experimental work for SBA
4. Resource materials and useful websites
5. Most favourable distractors (2001 – 2010 CE & AL Physics multiple-choice questions)

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Gp. No.	District Co-ordinators	Gp. No.	District Co-ordinators
1.	Mr. MUI Yuen Hung (梅元鴻)	13.	Mr. CHONG Yuk Leung (莊玉良) † Dr. LAU Yiu Hon (劉耀漢) *
2.	Mr. CHU Wing Yin (朱永賢)	14.	Mr. HONG Chung Yin (康仲賢) *
3.	Mr. CHIK Kin Hang (戚堅鏗)	15.	Mr. WONG Kwok Fai (黃國輝)
4.	Mr. TONG Hing Keung (唐慶強)	16.	Mr. TAM Kwok Wai (譚國偉)
5.	Ms. LIN Chi Wan (林紫雲)	17.	Mr. WAN Ka Kit (温家傑)
6.	Dr. NG Pun Hon (吳本韓)	18.	Mr. LAU Kwok Leung (劉國良)
7.	Mr. LEUNG Ngai Chung (梁毅聰)	19.	Mr. LO Wai Pui (羅偉培)
8.	Mr. MAK Tsz Pun (麥子彬)	20.	Mr. LEE Chi Ming (李志明)
9.	Mr. CHUNG Sai Chak (鍾世澤)	21.	Mr. YUE Kwok Wah (余國華)
10.	Mr. LAW Man Wai (羅文惠)	22.	Mr. LEE Wai Kit (李維傑)
11.	Mr. LAW Chak Sang (羅澤生)	23.	Mr. WONG Tong Pak (黃冬柏)
12.	Mr. PANG King Fai (彭景暉)	24.	Mr. YING Pui Chi, Bosco (英佩詞)

* indicates change of Co-ordinator

† HKAL Physics TAS only

Co-supervisors: Dr. LAU Yiu Hon (劉耀漢) and Dr. NG Pun Hon (吳本韓)
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HKDSE SBA Arrangement

A. SBA Requirement for 2012 Exam

	Minimun No. of Assessment per student		Minimum No. of tasks for S5 + S6 Learning &Teaching
	S5 (2011)	S6 (2012)	
	Experiment	Experiment	
	EXPT	**EXPT**	
Physics	1	2	EXPT >= 8
CS(Phy)	1	1	EXPT >= 4

	EXPT
Student's work	Individual / Group experiments suggested in the Curriculum and Assessment Guide
Assessment	Individual worksheet/simple report/detailed report/quiz (same mode for all students per task)
Teacher's work	Marking students' written work (worksheet/simple report/detailed report/quiz)

1. There is **no** need to deal with **Switching of Courses / Transfer Students / School Repeater** for S5 (2011) submission.
2. For details, please see Chapter 2 of the 2012 SBA Teachers' Handbook.
3. Please see also **SBA Sample Tasks** provided by HKEAA at http://www.hkeaa.edu.hk

B. Submission of Marks, Student Work Samples and Task Lists

Submission of Marks (Required for both S5 and S6)
1. Tentative Schedule: S5 (May – June 2011) ; S6 (January – February 2012)
2. Accept 0 to 10 marks (integer only) with '0 mark' means extremely poor performance. Assessment performed within a school should be standardized as **moderation will base on whole school** using mainly statistical approach.
3. Teachers are advised to arrange enough tasks for learning and teaching. However, in order to avoid unnecessary pressure that might be induced from SBA and to strike a balance, the following arrangement will be adopted:

		Maximum number of task titles that can be entered in the system	**Minimum** number of task titles that are required to enter in the system for **S5 + S6**
		EXPT	
Physics	S5	5	EXPT >= 8
	S6	2×5	
CS(Phy)	S5	3	EXPT >= 4
	S6	3	

4. Assessment marks for each student to be submitted to HKEAA should come from the task titles entered in the system. If the number of assessment marks entered for a student for a certain task exceeds the minimum requirement, the system will automatically average out the marks in the calculation of the final SBA mark of that student at S6 submission.

Submission of Student Work Samples (Only required in S6 submission)
1. S5: Submission of student work samples to HKEAA is **NOT** required.
2. S6: Submission of student work samples to HKEAA is required.
   - The system will select 6 students from the school (**NOT** teaching group) for submission of student work samples. All students will be selected if a school only has not more than 6 students taking the subject.
   - For each of the selected students, all S5 and S6 marked worksheet/simple report/detailed report/quiz should be submitted. Only the work with marks submitted to HKEAA is required. If the system is on-line (will be informed later), the work (**A4-size** paper preferred) should be combined into a single PDF file for uploading. That is, **one PDF file for each selected student**.

Submission of Task Lists (Required for both S5 and S6)
    Teachers are required to submit the **task list** of his/her teaching group. **One task list per teaching group** is required. If the system is on-line, the list (**A4-size** paper preferred) should be transformed into a single PDF file for uploading.

C. Support from District Coordinators
   - Teachers are required to submit the tentative task lists to the District Coordinator at the beginning of each academic year. District Coordinator will discuss with teachers in his/her group of the lists if needed.
   - Teachers need to attend a mid-year group meeting to share experience especially in consensus marking of SBA tasks.
   - Teachers and/or School Coordinators may discuss with District Coordinator if needs arise.
   - District Coordinator may also visit the schools of his/her group for professional sharing and collecting feedback.

Candidate No. _____   Bench No. _____   Total : 20 marks

Time allowed: 1 hour 30 minutes (Questions marked with "*" involve measurements. The first 60 minutes is for performing the experiment; all measurements must be finished within this period, and the remaining 30 minutes is for writing-up.)

Objective :   To determine the relationship between the period of oscillation and the load of a mass-spring system.

Apparatus :   1 spiral spring, 1 retort stand with 2 clamps, 1 glass bottle (with a cardboard adhered to its bottom), 1 half-metre rule, 5 slotted masses (50 g each), 1 $5 coin, 1 stop watch.

Experiment :
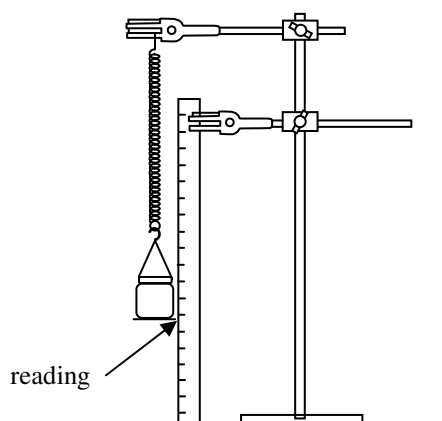
reading

*1.   Suspend the spiral spring from one of the clamps and attach the glass bottle to the lower end of the spring. Set up a vertical half-metre rule beside the spring as shown in the figure. Record the reading of the bottom of the bottle.

$$l_0 = \text{_____} \text{ cm}$$

*2.   Add one slotted mass to the bottle and record the reading of the bottom of the bottle.

$$l_{50} = \text{_____} \text{ cm}$$

3.   From the data obtained, estimate the force constant k, in N m^{-1}, of the spring. Take g to be 10 m s^{-2}.

4.   If the maximum error of each of the slotted masses is 0.5 g, estimate the error in the value of k obtained in Q.3 due to the uncertainty in masses and the scale uncertainty of the half-metre rule. You may assume g to be exact.

5. Apart from using a ruler with smaller scale divisions and masses of greater accuracy, describe and explain **ONE** way to improve the accuracy of the experiment.

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*6. Start the vertical oscillation of the glass bottle together with one slotted mass and measure the time for 30 complete oscillations. Repeat the experiment by increasing the slotted masses (M) added to the bottle to 100 g, 150 g, 200 g and 250 g and record the time for 30 complete oscillations respectively.

slotted masses added to the bottle M/kg	time for 30 oscillations			period of oscillation T/s	T^2/s^2
	t_1/s	t_2/s	mean t/s		
0.050					
0.100					
0.150					
0.200					
0.250					

7. Calculate the square of the periods (T^2) and plot a graph of T^2/s^2 against M/kg. Appropriate scales should be chosen such that both intercepts can be obtained.

8. It is known that the relationship between T^2 and M is

$$\frac{T^2}{4\pi^2} = \frac{m+M}{k}$$

    where k is the force constant of the spring and m is the effective total mass of the spring and the bottle. Obtain the values for k and m from the graph.

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9. With the data obtained and the apparatus available, describe the procedure for measuring the mass of a $5 coin.

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*10. By using the method proposed in Q.9, record the necessary measurement(s) taken and find the mass of the $5 coin.
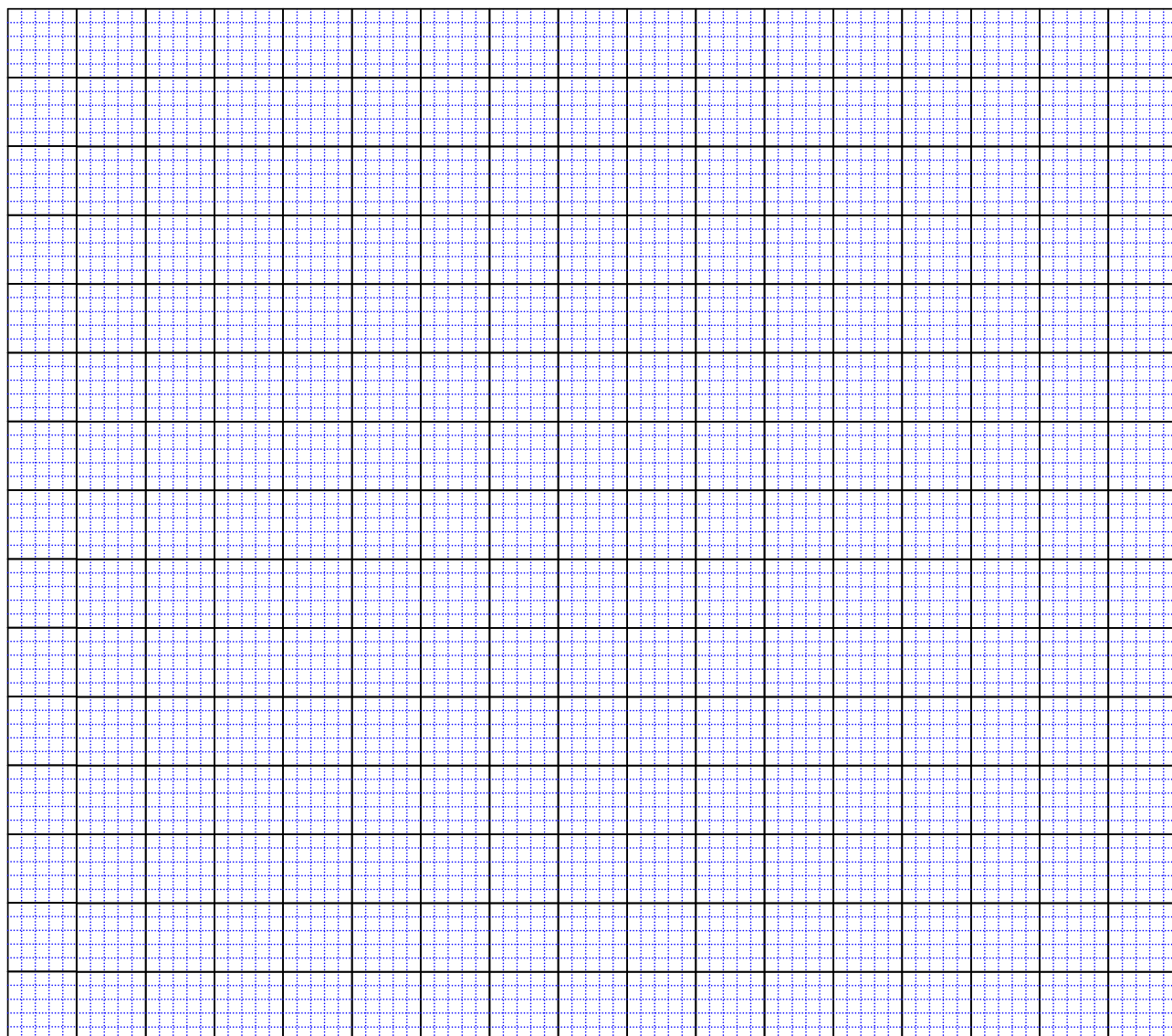
    _____

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    _____

END OF PAPER

考生編號：_____   實驗檯編號：_____   總分：20分

時間： 1 小時 30 分鐘 (標有「＊」的題目涉及數據量度。首 60 分鐘爲實驗操作時間，所有量度須於該時段內完成；餘下 30 分鐘爲整理答卷時間。)

目標： 探究質量-彈簧系統的振盪週期跟其負荷的關係。

儀器： 螺旋彈簧 (1)，附有 2 個鉗子的鐵架 (1)，底部貼有卡紙的玻璃瓶 (1)，半米尺 (1)，5 個有槽砝碼 (每個 50 g)，$5 硬幣 (1)，秒表 (1)。

實驗：

讀數
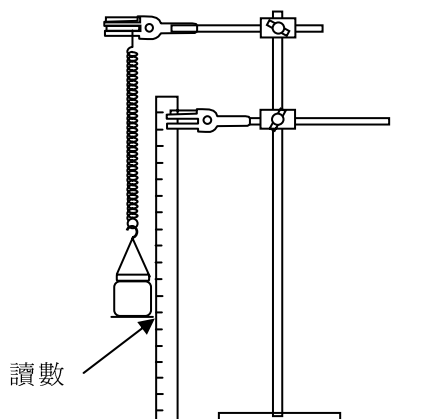
*1. 將螺旋彈簧掛在其中一個鉗子，而玻璃瓶則掛在彈簧的下端。如圖所示在彈簧旁邊設置一把豎直的半米尺。記錄玻璃瓶底部的讀數。

$$l_0 = \text{_____} \text{ cm}$$

*2. 在玻璃瓶內加入一個有槽砝碼，並記錄玻璃瓶底部的讀數。

$$l_{50} = \text{_____} \text{ cm}$$

3. 根據所得數據估算彈簧的力常數 k，以 N m^{-1} 表達。取 g 爲 10 m s^{-2}。

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4. 如果每個有槽砝碼的最大誤差爲 0.5 g，基於砝碼和半米尺標度的不確定性估算題 3 所得 k 值的誤差。你可假設 g 爲準確值。

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5. 除使用標度分格較小的尺子和較準確的砝碼外，描述並解釋一個可提高實驗準確度的方法。

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*6. 使玻璃瓶連同一個有槽砝碼作豎直振盪，並量度 30 個完整振盪的時間。增加瓶內有槽砝碼的質量 (M) 至 100 g、150 g、200 g 和 250 g 並重複實驗，分別記錄 30 個完整振盪的時間。

放進玻璃瓶的有槽砝碼質量 M/kg	30 個振盪的時間			振盪週期 T/s	T^2/s^2
	t_1/s	t_2/s	平均值 t/s		
0.050					
0.100					
0.150					
0.200					
0.250					

7. 計算週期的平方 (T^2)，並標繪 T^2/s^2 對 M/kg 的圖線。須選取適當的標度使能得到兩個截距。

8. 已知 T^2 跟 M 的關係式爲

$$\frac{T^2}{4\pi^2} = \frac{m+M}{k}$$

其中 k 爲彈簧的力常數而 m 爲彈簧加上玻璃瓶的有效總質量。利用圖線求 k 和 m 的值。

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9. 利用所得數據和所提供的儀器，描述量度一個 $5 硬幣質量的步驟。

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*10. 根據在第 9 題所建議的方法，記錄要進行的各項量度，並以此求 $5 硬幣的質量。

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Bench spaces	1 - 24
Apparatus	1 spiral spring 1 retort stand with 2 clamps 1 glass bottle (with a cardboard adhered to its bottom) 1 half-metre rule 5 slotted masses (50 g each) 1 $5 coin 1 stop watch
During session	Instruct candidates to dismantle the set-up after the experimental session.
Measurement after a.m. sessions	Repeat experiment to find the values of *k* and *m*.

Marking Scheme

Area A: Performance in Practical Work

1. The procedure for practical work is carried out safely   (1 mark)
   - **The apparatus do not fall on the bench or floor.**   **1 mark (Code 1)**

2. Work is done in an organized way   (1 mark)
   - **Graph is sketched or plotted during the taking of data / before the apparatus is dismantled or answering the questions.**   **1 mark (Code 2)**

3. Apparatus is handled competently   (3 marks)
   - **Half-metre rule is vertical and clamped firmly.**   **1 mark (Code 3)**
   - **Oscillations are more or less vertical.**   **1 mark (Code 4)**
   - **Small amplitude oscillations (i.e. the turns of spring do not press against each other during oscillations).**   **1 mark (Code 5)**

4. Instruments are used in appropriate ways to make accurate measurements   (2 marks)
   - **The glass bottle is set up properly such that the cardboard is more or less horizontal**   **1 mark (Code 6)**
   - **The cardboard adhered to the glass bottle is close to but not touching the half-metre rule when readings are being taken.**   **1 mark (Code 7)**

Area B: Reporting of Practical Work

1. Quality of the written account on the procedures and techniques   (2 marks)
   - Correct procedures described in a logical manner and method/equation to find the mass stated.   [Q.9] 2 marks

2. Quality of the recording of data   (4 marks)
   - **l_0 and l_{50} are recorded to the nearest mm or 0.5 mm**   [Q.1]&[Q.2] 1 mark
   - **All (*t*)'s are recorded and (T^2)'s calculated**
   - **Data points are correctly plotted using appropriate scales (>50% of the graph paper used).**   [Q.6] &[Q.7]2 marks
   - **Extension of spring due to the $5 coin / period of oscillations with the coin added is recorded.**   [Q.10] 1 mark

3. Quality of the presentation of results   (6 marks)
   - **Correct calculation of *k* (static method)**   [Q.3] 1 mark
   - **Correct estimation of Δ*l***
   - **Correct method of estimation of Δ*k***   [Q.4] 2 marks
   - **Calculation of slope shown**
   - ***k* from slope within ± 10% of examiner's value and *m* within ± 5 g**   [Q.8] 2 marks
   - **Mass of $5 coin within ± 2.5 g**   [Q.10] 1 mark

4. Quality of the interpretation of the results and conclusion   (1 mark)
   - **Correct method to improve the accuracy**   [Q.5] 1 mark

[Spiral Spring: Yik Fung Scientific Co. PM26C steel spring (220 × 6 mm dia) of mass 15.12 g
Mass of bottle = 88.31 g, mass of \$5 coin = 13.55 g]

1. $l_0 =$ _____32.90_____ cm

2. $l_{50} =$ _____35.45_____ cm

3. $k = F/(l_{50} - l_0) = mg/(l_{50} - l_0) = 0.050 \text{ kg} \times 10 \text{ m s}^{-2}/(0.3545 - 0.3296) \text{ m} = 19.6 \text{ N m}^{-1}$

4. $\Delta m = 0.5 \text{ g}$, $\Delta l_0 = \Delta l_{50} = 0.05 \text{ cm}$

$$\Delta k = k\left[\frac{\Delta m}{m} + \frac{\Delta(l_{50} - l_0)}{(l_{50} - l_0)}\right] = k\left[\frac{\Delta m}{m} + \frac{\Delta l_{50} + \Delta l_0}{(l_{50} - l_0)}\right] = 19.6 \times \left[\frac{0.5}{50} + \frac{0.05 + 0.05}{(35.45 - 32.90)}\right] = 1.0 \text{ N m}^{-1}$$

5. (1) More slotted masses can be added to produce a larger extension, and hence reduce the error due to scale uncertainty in measuring the extension of the spring.

   (2) Repeat the measurement a few more times to reduce the random error.

6.

slotted masses added to the bottle M/kg	time for 30 oscillations			period of oscillation T/s	T^2/s^2
	t_1/s	t_2/s	Mean t/s		
0.050	16.2	16.3	16.25	0.542	0.293
0.100	18.9	18.8	18.85	0.628	0.395
0.150	21.0	21.2	21.10	0.703	0.495
0.200	23.1	23.2	23.15	0.772	0.595
0.250	25.2	25.1	25.15	0.838	0.703

8. From the graph, slope $= \dfrac{0.700 - 0.140}{0.250 - (-0.025)} = 2.04 \text{ (s}^2 \text{ kg}^{-1})$, x-intercept $= -0.093$ (kg) [or y-intercept $= 0.191$ (s^2)]

   Rearranging the equation, we have $T^2 = \dfrac{4\pi^2}{k}M + \dfrac{4\pi^2}{k}m$

   slope $= \dfrac{4\pi^2}{k}$ or $2.04 = \dfrac{4\pi^2}{k} \Rightarrow k = \dfrac{4\pi^2}{2.04} = 19.4 \text{ N m}^{-1}$

   $m = -x$-intercept $= 0.093 \text{ kg} = 93 \text{ g}$ [or $m = y$-intercept/slope $= 0.191/2.04 = 0.0936 \text{ kg} = 94 \text{ g}$]

9. Any suitable method, for example:

   Suspend the spring from a clamp of the retort stand as shown in the figure on the question paper. Attach the glass bottle to the lower end of the spring. Fix a half-metre rule vertically besides the spring and the bottle.

   Record the reading of the bottom of the bottle on the half-metre rule. Place the \$5 coin inside the bottle. Take the reading of the bottom of the bottle again. Calculate the extension produced by the \$5 coin from the difference between the two positions of the bottom of the bottle. Repeat the procedure two more times. The mass M_{coin} is given by the equation

   $$M_{coin} = \frac{k \times \text{entension produced by the coin}}{g}$$

   where k is the force constant obtained in Q.8 and g is the acceleration due to gravity.

   [or

   ……. Place the \$5 coin inside the glass bottle, displace the bottle slightly in the vertical direction and then release to start the oscillations. Measure the time for 30 complete oscillations. Calculate the period T and the square of period T^2. Repeat the procedure and calculate the average value of T^2. Read the value of M corresponding to average value of T^2 from the graph obtained in Q.7. This value of M represents the mass of the \$5 coin.]

   [Accept using the \$5 coin together with a few 50 g slotted masses]

10. Extension produced by the \$5 coin $= 33.60 - 32.90 = 0.70 \text{ cm}$, $33.60 - 32.90 = 0.70 \text{ cm}$, $33.60 - 32.90 = 0.70 \text{ cm}$

    Average extension $= (0.70 + 0.70 + 0.70)/3 = 0.70 \text{ cm}$

    Mass of coin $M_{coin} = 19.4 \text{ N m}^{-1} \times 0.0070/10 = 0.0137 \text{ kg} = 14 \text{ g}$

    [or $30T = 13.9 \text{ s}$, 13.9 s. average $T^2 = 0.215 \text{ s}^2$

    From the graph, mass of coin $M_{coin} = 0.014 \text{ kg} = 14 \text{ g}$]

The table below illustrates the considerable scope which teachers have in choosing practical work for SBA. It is hoped that this can help teachers plan their assessment arrangement. However, teachers should feel free to devise their own practical activities for assessment in particular areas of the syllabus as long as they are **of appropriate standard** and can meet the criteria for awarding marks. **There is no list of prescribed or recommended practical work which must be used for assessment purposes** since teaching interests and resources vary from school to school.

Suggested experimental work for SBA	*Syllabus Topic of HKDSE*
Measurement of the specific heat capacity of a liquid using a low voltage immersion heater and a foam cup.	(I)
Measurement of the specific latent heat of fusion of ice using a low voltage immersion heater.	(I)
Measurement of the specific latent heat of vaporization of water using a mains heater.	(I)
Investigation of the relationship between pressure, volume and temperature of a gas.	(I)
Study the effects of the normal force, materials involved and surface area on the force of friction using a block.	(II)
Investigation of the relationship between (a) acceleration and force when the mass is constant; and (b) acceleration and mass under a constant force.	(II)
Conservation of linear momentum in elastic/inelastic collision of trolleys (further investigation on loss of kinetic energy in inelastic collisions).	(II)
Experimental test of $F = \dfrac{mv^2}{r}$ by whirling a rubber bung.	(II)
Estimation of the wavelength of light using (a) double slit; and (b) plane diffraction grating.	(III)
Measurement of focal length of convex lenses by different methods: (a) image formation of a distant object; (b) plane mirror method; and (c) lens formula.	(III)
Plotting equipotential lines on a high-resistance conducting surface.	(IV)
Drop in terminal p.d. of power supplies delivering current and using different voltmeters to measure the terminal p.d. of a power supply with high internal resistance.	(IV)
Using a current balance to measure the magnetic fields (a) between two magnadur magnets; (b) close to the end of a current-carrying coil; and (c) inside a flat solenoid carrying current.	(IV)
Using a Hall probe or a search coil to investigate the magnetic fields (a) around a long straight wire; (b) at the centre of a coil; (c) inside and around a slinky solenoid; and (d) inside a solenoid, carrying current.	(IV)
Investigation of the factors affecting the induced e.m.f. in a coil.	(IV)
Study of transformer action : (a) the effect of the flux linkage; (b) the relationship between voltage ratio and turn ratio; (c) the dependence of the current in the primary coil on the loading; and (d) comparison between input and output power.	(IV)
(a) Measurement of the resistance of a conductor with a voltmeter and an ammeter (Ohm's law). (b) Change of the resistance of filament of a lamp with temperature. (c) Change of the resistance of a conductor with its length and cross-sectional area.	(IV)
Measurement of the internal resistance of a battery.	(IV)
Study of the factors affecting the strength of an electromagnet.	(IV)
Use of the oscilloscope as a d.c. and an a.c. voltmeter, for waveform display and time base for frequency measurement.	-

下表列出課程內較合選作校本評核的實驗，藉此希望有助教師規劃其評核安排。此外，教師亦可在課程的某些範圍中設計自己的評核活動，惟該活動須具適當水平並符合評核的準則。因為每間學校的教學重點及可用資源有異，因此該校本評核的建議實驗名單並非硬性規定。

校本評核的建議實驗名單	HKDSE 課程範圍
用低壓浸沒式電熱器和發泡膠杯量度液體的比熱容量。	(I)
用低壓浸沒式電熱器量度冰的熔解比潛熱。	(I)
用電熱器量度水的汽化比潛熱。	(I)
探究氣體壓強、體積和溫度的關係。	(I)
利用方塊探究法向力、所涉材料和表面面積對摩擦力的影響。	(II)
探討以下關係 (c) 當質量恆定時，加速度和力的關係； (d) 在恆力下，加速度和質量的關係。	(II)
小車彈性 / 非彈性碰撞中的線動量守恆 (進一步探究非彈性碰撞中的動能損失)。	(II)
以迴轉橡膠塞驗證 $F = \dfrac{mv^2}{r}$。	(II)
用下列器材估計光波的波長： (a) 雙窄縫； (b) 平面衍射光柵。	(III)
以不同方法測量凸透鏡的焦距: (a) 遙遠物體的成象； (b) 平面鏡方法； (c) 透鏡公式。	(III)
繪畫高電阻導電平面上的等勢線。	(IV)
在輸出電流時，電源兩端電勢差減少。用不同伏特計量度高內阻電源兩端的電勢差。	(IV)
用電流天平量度 (a) 兩瑪格納多爾磁鐵間的磁場； (b) 接近載流線圈末端的磁場； (c) 載流扁螺線管內的磁場。	(IV)
用霍耳探測器或探察線圈探討下列載流導體所產生的磁場： (a) 在長直導線周圍； (b) 在線圈中心； (c) 在軟螺線管內和周圍； (d) 在螺線管內。	(IV)
探討影響線圈的感生電動勢的因素。	(IV)
研究變壓器的運作： (a) 磁通匝鏈數的效應； (b) 電壓比與匝數比的關係； (c) 負荷對原線圈電流的影響； (d) 輸入和輸出功率的比	(IV)
(a) 用伏特計和安培計量度導體的電阻 (歐姆定律)。 (b) 燈絲的電阻隨其溫度的變化。 (c) 導體的電阻隨其長度及截面積的變化。	(IV)
測定電池組的內阻。	(IV)
研究影響電磁鐵強度的因素	(IV)
示波器用作直流與交流電伏特計、波形演示以及用時基來量度頻率。	-

Resource Materials & Useful Websites
A. ***Science Education Section, Education Bureau***

1. Learning and Teaching Strategies
   - Investigative Study 2007 & 2009
     http://cd1.edb.hkedcity.net/cd/science/physics/NSS/nssphy_e.htm#30072007
     http://cd1.edb.hkedcity.net/cd/science/physics/NSS/nssphy_e.htm#t07072009
   - School-based Practical Work 2007
     http://cd1.edb.hkedcity.net/cd/science/physics/NSS/nssphy_e.htm#t13072007
2. Assessing Student Learning
   - School-based Assessment (SBA) 2009
     http://cd1.edb.hkedcity.net/cd/science/physics/NSS/nssphy_e.htm#t08072009
3. 物理科實驗技巧/物理實驗教材（影片剪輯）
   http://edblog.hkedcity.net/cdiphysics
4. 中六物理科實驗技能評估示例（影片剪輯）
   http://edblog.hkedcity.net/cdiphysics
5. Error Treatment in Physics Practical
   http://cd1.edb.hkedcity.net/cd/science/physics/ErrorTreatment.pdf
6. Notes on the Use of Units in Physics / 物理單位使用須知
   http://cd1.edb.hkedcity.net/cd/science/physics/notes_on_units.pdf
7. 高解像度運動錄像分析軟件(HDMVA)下載網址
   （需要安裝Vista Codec同LabVIEW Run-time Engine 2009才能順利執）
   http://www.hk-phy.org/hdmva/update/4.00.zip
8. Resources on laboratory safety and management
   http://cd1.edb.hkedcity.net/cd/science/laboratory/content_safety.html
9. 科學實驗室安全手冊（香港特別行政區教育署，2002）
   http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/SHB_2002c.pdf
   http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/SHB_2002e.pdf
10. Reference List of Furniture and Equipment for NSS Physics Curriculum
    http://www.edb.gov.hk/index.aspx?nodeID=5535&langno=1
11. 在學校使用密封放射源作教學用途
    http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/ra_source_c.pdf
    http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/ra_source_e.pdf

B. ***Hong Kong Examination and Assessment Authority***

1. 香港中學文憑考試校本評核簡介小冊子
   http://www.hkeaa.edu.hk/DocLibrary/Media/Leaflets/SBA_pamphlet_C_web.pdf
   http://www.hkeaa.edu.hk/DocLibrary/Media/Leaflets/SBA_pamphlet_E_web.pdf
2. 校本評核推行時間表
   http://www.hkeaa.edu.hk/tc/SBA/sba_hkdse/SBA_timetable.html
   http://www.hkeaa.edu.hk/en/SBA/sba_hkdse/SBA_timetable.html
3. 校本評核學校領導人手冊
   http://www.hkeaa.edu.hk/DocLibrary/SBA/HKDSE/SBAhandbook-SchoolLeaders-C-300609.pdf
   http://www.hkeaa.edu.hk/DocLibrary/SBA/HKDSE/SBAhandbook-SchoolLeaders-E-300609.pdf
4. 分數調整機制小冊子
   http://www.hkeaa.edu.hk/DocLibrary/SBA/booklet_sba.pdf
5. 校本評核分數調整機制釋疑
   http://www.hkeaa.edu.hk/DocLibrary/SBA/About_SBA/2008_01_31_SBA_article.pdf

C. ***Some Useful Websites***

1. Physics Teachers Professional Development and Resources Sharing Platform
   http://edblog.hkedcity.net/cdiphysics
2. Investigative Study（探究研習）
   http://www.isphys.ust.hk/
3. Nuffield Foundation Practical Physics
   http://www.practicalphysics.org/

Multiple Choice, CE-level
Most Favourable Distractor

	2001		2002		2003		2004		2005
1.	A (22.7%)	1.	B (24.0%)	1.	C (9.5%)	1.	D (15.1%)	1.	C (4.1%)
2.	E (53.4%)	2.	C (27.3%)	2.	B (15.6%)	2.	D (19.8%)	2.	C (7.5%)
3.	E (23.5%)	3.	D (33.3%)	3.	B (7.8%)	3.	D (17.2%)	3.	B (15.0%)
4.	A (22.5%)	4.	A (10.9%)	4.	C (12.7%)	4.	A (35.2%)	4.	B (11.0%)
5.	B (22.1%)	5.	A (23.4%)	5.	B (38.5%)	5.	A (26.5%)	5.	A (8.9%)
6.	C (20.2%)	6.	B (25.4%)	6.	D (20.1%)	6.	C (33.6%)	6.	D (35.9%)
7.	A (58.8%)	7.	D (19.7%)	7.	A (27.6%)	7.	C (19.3%)	7.	D (30.1%)
8.	A (24.7%)	8.	D (23.1%)	8.	A (69.9%)	8.	B (35.7%)	8.	C (20.7%)
9.	D (19.7%)	9.	D (37.4%)	9.	C (18.7%)	9.	B (36.4%)	9.	B (7.0%)
10.	B (18.5%)	10.	C (44.2%)	10.	C (22.9%)	10.	A (13.4%)	10.	B (16.7%)
11.	B (21.9%)	11.	C (32.5%)	11.	C (21.8%)	11.	D (19.2%)	11.	B (15.6%)
12.	D (19.7%)	12.	C (39.0%)	12.	D (41.6%)	12.	C (21.8%)	12.	A (21.2%)
13.	C (12.1%)	13.	A (12.8%)	13.	C (20.2%)	13.	A (13.5%)	13.	D (7.0%)
14.	E (14.4%)	14.	B (10.3%)	14.	B (21.3%)	14.	B (12.8%)	14.	C (13.7%)
15.	B (17.8%)	15.	B (15.3%)	15.	D (29.0%)	15.	A (23.3%)	15.	D (20.5%)
16.	C (29.3%)	16.	A (17.8%)	16.	A (22.0%)	16.	A (33.5%)	16.	D (19.1%)
17.	B (8.0%)	17.	B (25.1%)	17.	C (15.9%)	17.	A (16.1%)	17.	A (28.6%)
18.	D (32.6%)	18.	D (22.5%)	18.	B (36.8%)	18.	D (24.8%)	18.	B (20.2%)
19.	D (19.0%)	19.	D (12.5%)	19.	B (21.9%)	19.	D (25.4%)	19.	B (19.8%)
20.	D (46.9%)	20.	C (19.0%)	20.	A (40.4%)	20.	C (25.2%)	20.	D (5.7%)
21.	A (17.4%)	21.	B (49.6%)	21.	D (16.0%)	21.	C (17.2%)	21.	B (12.1%)
22.	B (11.3%)	22.	C (20.2%)	22.	A (12.5%)	22.	D (10.7%)	22.	C (14.4%)
23.	D (20.6%)	23.	D (37.2%)	23.	D (20.0%)	23.	A (50.4%)	23.	D (6.6%)
24.	B (22.3%)	24.	C (10.6%)	24.	D (18.1%)	24.	C (24.0%)	24.	A (21.4%)
25.	C (18.2%)	25.	B (21.0%)	25.	B (18.2%)	25.	A (51.0%)	25.	B (13.4%)
26.	C (15.4%)	26.	D (5.6%)	26.	A (21.4%)	26.	B (10.5%)	26.	A (19.7%)
27.	D (27.3%)	27.	D (42.3%)	27.	A (13.9%)	27.	B (13.9%)	27.	B (30.0%)
28.	E (22.3%)	28.	D (5.1%)	28.	A (15.9%)	28.	B (27.2%)	28.	D (26.0%)
29.	C (13.4%)	29.	D (17.0%)	29.	D (3.7%)	29.	B (37.7%)	29.	D (16.2%)
30.	B (25.6%)	30.	B (18.9%)	30.	C (7.5%)	30.	B (10.9%)	30.	D (22.4%)
31.	B (8.3%)	31.	B (43.4%)	31.	D (18.4%)	31.	D (27.6%)	31.	C (15.5%)
32.	C (16.1%)	32.	C (30.2%)	32.	B (27.6%)	32.	C (28.0%)	32.	B (21.6%)
33.	E (9.9%)	33.	A (26.2%)	33.	C (30.0%)	33.	A (12.4%)	33.	C (13.6%)
34.	D (27.6%)	34.	B (22.0%)	34.	D (17.3%)	34.	C (27.6%)	34.	D (17.2%)
35.	E (18.7%)	35.	A (36.0%)	35.	A (10.5%)	35.	B (30.6%)	35.	C (25.6%)
36.	E (14.7%)	36.	C (19.7%)	36.	A (27.4%)	36.	C (28.8%)	36.	D (11.5%)
37.	D (15.0%)	37.	C (21.7%)	37.	A (32.1%)	37.	A (7.5%)	37.	B (9.8%)
38.	E (17.5%)	38.	C (27.4%)	38.	B (40.0%)	38.	B (16.6%)	38.	C (54.1%)
39.	A (7.9%)	39.	A (15.5%)	39.	C (28.6%)	39.	D (17.3%)	39.	D (22.5%)
40.	C (10.5%)	40.	C (19.3%)	40.	D (12.3%)	40.	B (24.0%)	40.	D (11.6%)
41.	E (28.2%)	41.	D (8.1%)	41.	B (25.6%)	41.	B (17.0%)	41.	D (22.7%)
42.	A (31.9%)	42.	D (19.9%)	42.	D (35.7%)	42.	B (26.4%)	42.	C (17.4%)
43.	C (16.7%)	43.	C (15.0%)	43.	A (24.2%)	43.	B (31.6%)	43.	B (25.4%)
44.	B (31.8%)	44.	B (17.7%)	44.	D (28.5%)	44.	C (12.3%)	44.	D (11.0%)
45.	C (11.6%)	45.	A (14.3%)	45.	C (32.6%)	45.	D (17.2%)	45.	D (21.4%)

Multiple Choice, CE-level
Most Favourable Distractor

	2006		**2007**		**2008**		**2009**		**2010**
1.	A (28%)	1.	A (16%)	1.	D (6%)	1.	B (6%)	1.	A (10%)
2.	B (21%)	2.	A (11%)	2.	B (15%)	2.	C (12%)	2.	A (17%)
3.	D (28%)	3.	A (27%)	3.	B (22%)	3.	B (13%)	3.	A (8%)
4.	C (35%)	4.	C (34%)	4.	C (3%)	4.	B (17%)	4.	A (12%)
5.	A (13%)	5.	B (55%)	5.	B (41%)	5.	B (5%)	5.	C (11%)
6.	C (25%)	6.	B (9%)	6.	B (9%)	6.	D (34%)	6.	A (5%)
7.	A (11%)	7.	D (29%)	7.	D (30%)	7.	C (13%)	7.	C (33%)
8.	B (13%)	8.	D (13%)	8.	A (31%)	8.	A (9%)	8.	D (23%)
9.	D (29%)	9.	D (9%)	9.	B (14%)	9.	D (17%)	9.	C (12%)
10.	C (7%)	10.	D (19%)	10.	B (9%)	10.	A (6%)	10.	B (13%)
11.	C (20%)	11.	A (12%)	11.	D (16%)	11.	C (9%)	11.	B (19%)
12.	C (16%)	12.	C (24%)	12.	A (12%)	12.	A (29%)	12.	A (16%)
13.	C (15%)	13.	D (16%)	13.	C (38%)	13.	C (11%)	13.	D (15%)
14.	B (16%)	14.	C (17%)	14.	B (10%)	14.	A (19%)	14.	B (29%)
15.	C (24%)	15.	A (12%)	15.	D (14%)	15.	B (25%)	15.	B (5%)
16.	C (15%)	16.	D (13%)	16.	D (16%)	16.	B (15%)	16.	B (22%)
17.	D (20%)	17.	C (22%)	17.	C (16%)	17.	C (24%)	17.	A (35%)
18.	A (15%)	18.	C (12%)	18.	A (16%)	18.	A (15%)	18.	B (23%)
19.	D (27%)	19.	C (34%)	19.	C (15%)	19.	A (43%)	19.	D (16%)
20.	C (12%)	20.	B (17%)	20.	C (9%)	20.	C (65%)	20.	A (14%)
21.	C (26%)	21.	B (11%)	21.	B (8%)	21.	A (17%)	21.	B (28%)
22.	C (10%)	22.	D (20%)	22.	D (20%)	22.	C (23%)	22.	A (25%)
23.	C (24%)	23.	C (19%)	23.	A (13%)	23.	B (9%)	23.	D (19%)
24.	B (22%)	24.	B (29%)	24.	C (12%)	24.	A (9%)	24.	B (58%)
25.	B (16%)	25.	D (9%)	25.	B (24%)	25.	D (17%)	25.	D (9%)
26.	A (27%)	26.	A (4%)	26.	D (13%)	26.	B (35%)	26.	D (12%)
27.	C (40%)	27.	A (28%)	27.	C (2%)	27.	C (30%)	27.	B (27%)
28.	D (29%)	28.	D (18%)	28.	B (26%)	28.	D (21%)	28.	B (23%)
29.	C (26%)	29.	C (28%)	29.	C (29%)	29.	A (19%)	29.	C (31%)
30.	C (15%)	30.	C (24%)	30.	A (9%)	30.	A (21%)	30.	B (29%)
31.	A (21%)	31.	A (39%)	31.	B (13%)	31.	B (23%)	31.	A (30%)
32.	A (25%)	32.	B (37%)	32.	C (11%)	32.	A (19%)	32.	D (16%)
33.	C (45%)	33.	B (33%)	33.	A (7%)	33.	D (27%)	33.	D (24%)
34.	B (19%)	34.	D (15%)	34.	C (5%)	34.	C (27%)	34.	D (33%)
35.	C (27%)	35.	B (21%)	35.	D (13%)	35.	B (16%)	35.	C (61%)
36.	D (25%)	36.	A (10%)	36.	D (18%)	36.	B (26%)	36.	B (29%)
37.	D (22%)	37.	C (19%)	37.	B (15%)	37.	D (18%)	37.	B (16%)
38.	B (39%)	38.	D (38%)	38.	D (18%)	38.	B (22%)	38.	B (21%)
39.	B (30%)	39.	B (41%)	39.	A (27%)	39.	C (24%)	39.	D (35%)
40.	D (34%)	40.	A (25%)	40.	B (24%)	40.	A (33%)	40.	B (18%)
41.	B (25%)	41.	C (22%)	41.	D (19%)	41.	B (28%)	41.	C (30%)
42.	B (27%)	42.	B (32%)	42.	A (45%)	42.	B (15%)	42.	B (32%)
43.	C (31%)	43.	B (16%)	43.	D (20%)	43.	A (14%)	43.	A (17%)
44.	A (28%)	44.	B (33%)	44.	A (21%)	44.	D (26%)	44.	C (26%)
45.	A (63%)	45.	D (15%)	45.	A (12%)	45.	C (16%)	45.	C (29%)

Multiple Choice, A-level
Most Favourable Distractor

AL-PHY

	2001		2002		2003		2004		2005
1.	C (78%)	1.	A (54%)	1.	B (67%)	1.	A (35%)	1.	C (48%)
2.	D (24%)	2.	A (18%)	2.	C (46%)	2.	A (28%)	2.	C (69%)
3.	B (50%)	3.	C (30%)	3.	B (30%)	3.	D (40%)	3.	A (31%)
4.	B (14%)	4.	A (42%)	4.	A (34%)	4.	B (29%)	4.	A (41%)
5.	D (26%)	5.	B (17%)	5.	B (63%)	5.	B (62%)	5.	D (30%)
6.	A (8%)	6.	B (31%)	6.	C (11%)	6.	C (10%)	6.	B (29%)
7.	D (24%)	7.	C (4%)	7.	C (28%)	7.	C (13%)	7.	D (18%)
8.	E (21%)	8.	A (65%)	8.	A (19%)	8.	D (26%)	8.	A (43%)
9.	C (16%)	9.	D (41%)	9.	A (26%)	9.	D (23%)	9.	A (32%)
10.	C (24%)	10.	D (19%)	10.	B (20%)	10.	A (36%)	10.	B (29%)
11.	B (28%)	11.	C (37%)	11.	C (16%)	11.	B (16%)	11.	A (28%)
12.	D (28%)	12.	C (40%)	12.	C (29%)	12.	C (32%)	12.	D (31%)
13.	C (17%)	13.	B (20%)	13.	A (76%)	13.	C (41%)	13.	C (19%)
14.	C (22%)	14.	B (11%)	14.	D (9%)	14.	D (26%)	14.	A (49%)
15.	A (12%)	15.	B (34%)	15.	C (21%)	15.	B (16%)	15.	D (32%)
16.	C (21%)	16.	C (41%)	16.	A (15%)	16.	A (9%)	16.	C (18%)
17.	A (32%)	17.	B (34%)	17.	A (38%)	17.	C (19%)	17.	C (21%)
18.	B (31%)	18.	D (14%)	18.	B (8%)	18.	C (35%)	18.	A (28%)
19.	C (18%)	19.	C (25%)	19.	B (11%)	19.	A (34%)	19.	D (30%)
20.	D (36%)	20.	D (52%)	20.	C (23%)	20.	D (15%)	20.	A (19%)
21.	A (40%)	21.	D (30%)	21.	D (22%)	21.	B (57%)	21.	D (8%)
22.	B (18%)	22.	C (6%)	22.	B (21%)	22.	C (25%)	22.	B (12%)
23.	D (55%)	23.	B (28%)	23.	A (41%)	23.	C (9%)	23.	C (12%)
24.	C (28%)	24.	C (45%)	24.	D (33%)	24.	D (24%)	24.	A (17%)
25.	C (15%)	25.	D (32%)	25.	A (14%)	25.	C (22%)	25.	B (39%)
26.	A (27%)	26.	A (6%)	26.	A (27%)	26.	C (20%)	26.	C (22%)
27.	A (34%)	27.	A (13%)	27.	D (29%)	27.	B (65%)	27.	C (10%)
28.	D (41%)	28.	C (63%)	28.	B (26%)	28.	A (31%)	28.	B (14%)
29.	E (32%)	29.	B (42%)	29.	B (17%)	29.	C (21%)	29.	C (30%)
30.	D (26%)	30.	D (5%)	30.	C (12%)	30.	B (34%)	30.	D (31%)
31.	D (16%)	31.	D (45%)	31.	A (14%)	31.	B (35%)	31.	C (36%)
32.	E (12%)	32.	C (6%)	32.	B (32%)	32.	B (39%)	32.	C (18%)
33.	D (28%)	33.	D (31%)	33.	C (22%)	33.	D (39%)	33.	C (13%)
34.	C (25%)	34.	C (25%)	34.	A (36%)	34.	B (47%)	34.	A (14%)
35.	C (33%)	35.	D (24%)	35.	C (17%)	35.	B (32%)	35.	B (17%)
36.	D (30%)	36.	D (59%)	36.	C (24%)	36.	A (14%)	36.	B (18%)
37.	C (36%)	37.	B (26%)	37.	A (31%)	37.	D (25%)	37.	B (17%)
38.	E (21%)	38.	A (20%)	38.	D (46%)	38.	A (24%)	38.	D (16%)
39.	E (23%)	39.	A (17%)	39.	D (20%)	39.	B (18%)	39.	C (36%)
40.	E (32%)	40.	B (24%)	40.	D (24%)	40.	A (20%)	40.	C (22%)
41.	C (14%)	41.	A (13%)	41.	A (35%)	41.	C (28%)	41.	D (23%)
42.	A (13%)	42.	C (15%)	42.	D (37%)	42.	D (27%)	42.	A (22%)
43.	C (5%)	43.	C (20%)	43.	C (27%)	43.	B (17%)	43.	A (26%)
44.	B (15%)	44.	D (19%)	44.	C (14%)	44.	D (13%)	44.	B (16%)
45.	E (16%)	45.	D (36%)	45.	C (46%)	45.	A (29%)	45.	C (39%)

	2006		2007		2008		2009		2010
1.	B (32%)	1.	C (20%)	1.	C (39%)	1.	C (33%)	1.	B (28%)
2.	D (32%)	2.	C (29%)	2.	B (21%)	2.	D (19%)	2.	C (26%)
3.	D (18%)	3.	A (32%)	3.	B (18%)	3.	B (33%)	3.	A (24%)
4.	B (16%)	4.	C (9%)	4.	C (18%)	4.	B (33%)	4.	C (17%)
5.	D (22%)	5.	B (15%)	5.	A (21%)	5.	C (31%)	5.	C (20%)
6.	B (26%)	6.	A (10%)	6.	C (57%)	6.	D (30%)	6.	C (18%)
7.	A (42%)	7.	D (19%)	7.	C (21%)	7.	B (24%)	7.	C (9%)
8.	D (32%)	8.	B (22%)	8.	C (22%)	8.	D (41%)	8.	B (39%)
9.	B (9%)	9.	C (19%)	9.	D (26%)	9.	C (37%)	9.	D (8%)
10.	C (38%)	10.	C (13%)	10.	C (22%)	10.	C (35%)	10.	D (29%)
11.	A (22%)	11.	D (16%)	11.	D (16%)	11.	C (35%)	11.	B (42%)
12.	C (14%)	12.	D (33%)	12.	A (34%)	12.	A (19%)	12.	C (23%)
13.	B (18%)	13.	D (12%)	13.	C (18%)	13.	A (32%)	13.	A (46%)
14.	C (27%)	14.	A (17%)	14.	D (43%)	14.	B (22%)	14.	A (17%)
15.	B (69%)	15.	D (19%)	15.	C (37%)	15.	A (27%)	15.	B (22%)
16.	B (30%)	16.	C (18%)	16.	B (33%)	16.	C (21%)	16.	C (30%)
17.	B (36%)	17.	B (33%)	17.	D (33%)	17.	A (21%)	17.	C (14%)
18.	C (9%)	18.	C (44%)	18.	C (30%)	18.	C (39%)	18.	C (21%)
19.	D (24%)	19.	D (20%)	19.	B (28%)	19.	A (50%)	19.	D (36%)
20.	C (30%)	20.	A (24%)	20.	C (28%)	20.	C (14%)	20.	D (17%)
21.	B (31%)	21.	B (33%)	21.	B (9%)	21.	C (20%)	21.	B (50%)
22.	B (7%)	22.	B (48%)	22.	C (17%)	22.	B (23%)	22.	A (9%)
23.	B (15%)	23.	C (19%)	23.	C (12%)	23.	C (20%)	23.	D (33%)
24.	A (21%)	24.	C (12%)	24.	C (18%)	24.	A (28%)	24.	C (16%)
25.	B (22%)	25.	A (31%)	25.	D (27%)	25.	D (18%)	25.	D (34%)
26.	A (25%)	26.	C (18%)	26.	D (44%)	26.	A (15%)	26.	D (42%)
27.	D (16%)	27.	B (28%)	27.	C (27%)	27.	A (15%)	27.	A (23%)
28.	C (18%)	28.	C (30%)	28.	C (30%)	28.	B (27%)	28.	A (22%)
29.	B (25%)	29.	D (51%)	29.	C (31%)	29.	C (29%)	29.	B (51%)
30.	C (31%)	30.	B (46%)	30.	D (27%)	30.	C (15%)	30.	D (10%)
31.	C (29%)	31.	C (28%)	31.	D (16%)	31.	B (46%)	31.	C (15%)
32.	B (19%)	32.	A (16%)	32.	C (31%)	32.	A (27%)	32.	C (27%)
33.	C (10%)	33.	C (30%)	33.	C (49%)	33.	B (10%)	33.	A (26%)
34.	B (24%)	34.	C (32%)	34.	C (28%)	34.	C (26%)	34.	B (27%)
35.	C (54%)	35.	B (12%)	35.	A (45%)	35.	A (39%)	35.	D (23%)
36.	C (35%)	36.	C (20%)	36.	B (6%)	36.	B (21%)	36.	B (31%)
37.	A (10%)	37.	A (27%)	37.	D (33%)	37.	B (13%)	37.	D (16%)
38.	B (30%)	38.	C (20%)	38.	B (32%)	38.	B (23%)	38.	B (24%)
39.	C (24%)	39.	C (13%)	39.	D (33%)	39.	B (18%)	39.	C (27%)
40.	A (44%)	40.	C (19%)	40.	B (16%)	40.	D (35%)	40.	C (27%)
41.	C (20%)	41.	B (24%)	41.	C (18%)	41.	C (23%)	41.	C (34%)
42.	C (36%)	42.	B (15%)	42.	C (25%)	42.	D (17%)	42.	C (25%)
43.	B (21%)	43.	D (10%)	43.	B (27%)	43.	B (31%)	43.	D (26%)
44.	A (12%)	44.	B (18%)	44.	C (43%)	44.	D (23%)	44.	D (24%)
45.	D (31%)	45.	A (37%)	45.	C (33%)	45.	B (14%)	45.	A (20%)