

# Exam Paper Format

The latest HKCE Physics Examination, starting from 2005, consists of two papers.

	Paper 1		Paper 2	
Types of questions	Conventional questions		Multiple-choice questions	
Duration	1 hour 45 minutes		1 hour	
Percentage share of the total marks	60% $\left\{ \begin{array}{l} 36\% \text{ (Section A)} \\ 24\% \text{ (Section B)} \end{array} \right.$		40%	
Details of the papers	<u>Section A</u> <ul style="list-style-type: none"> <li>• 8 to 10 compulsory short questions from the core syllabus</li> <li>• Each question consists of 2 to 3 parts</li> </ul>	<u>Section B</u> <ul style="list-style-type: none"> <li>• 3 to 5 compulsory long questions from the whole syllabus</li> <li>• Each question consists of 5 to 6 parts</li> </ul>	<u>Section A</u> <ul style="list-style-type: none"> <li>• 25 to 30 compulsory questions from the core syllabus</li> </ul>	<u>Section B</u> <ul style="list-style-type: none"> <li>• 15 to 20 compulsory questions from the whole syllabus</li> </ul>
				<ul style="list-style-type: none"> <li>• Totally consist of 45 multiple-choice questions.</li> <li>• Four options will be provided in each question</li> </ul>

# Comparison between NEW and OLD syllabuses

In the NEW Physics syllabus, some topics are removed and some are newly added. Moreover, the syllabus is divided into two parts: **core** and **extension**. Some difficult topics are grouped under the extension part and they will only be asked in Section B of both Papers 1 and 2.

## (a) Topics removed from and added to the syllabus

The following table shows the topics that are removed from and added to the syllabus. Questions involving the removed topics in past examination papers are now out of the syllabus, while the newly added topics are allocated in both the core and extension parts. Students should pay more attention to the new topics during revision.

Section	Topics removed	Topics added
Optics	<ul style="list-style-type: none"><li>• Reflection by curved mirrors</li><li>• Optical instruments: magnifying glass, microscope, telescope, human eye, camera</li></ul>	—
Heat	<ul style="list-style-type: none"><li>• Gas laws, Kinetic theory</li></ul>	<ul style="list-style-type: none"><li>• Transfer process of heat (conduction, convection and radiation)</li></ul>
Mechanics	<ul style="list-style-type: none"><li>• Pressure as force per unit area</li><li>• Moment produced by a force</li><li>• Machine</li></ul>	—
Waves	<ul style="list-style-type: none"><li>• Standing (stationary) waves</li><li>• Viewing water wavefront by stroboscope</li></ul>	<ul style="list-style-type: none"><li>• Using the unit decibel to represent the sound intensity level</li><li>• Noise pollution and acoustic protection</li></ul>
Electricity and Magnetism	<ul style="list-style-type: none"><li>• CRO, electronic devices, logic gates</li><li>• Charging by using an E.H.T power supply</li></ul>	—
Atomic Physics	<ul style="list-style-type: none"><li>• <math>\alpha</math>-particle scattering experiment</li></ul>	<ul style="list-style-type: none"><li>• Using sievert as a unit to measure radiation dosage</li><li>• Nuclear fusion and solar energy</li></ul>

# ***New Types of Questions in the Examination***

## **(a) Daily life Physics**

Other than traditional aims, the new syllabus serves to help students develop interest and motivation in their study of Physics. To serve this purpose, examination questions will involve situations about daily life or social concern which are related to Physics. As a result, questions related to the following areas will appear in future examination papers:

- application of Physics to daily life
- historical and current development in Physics
- science and technology in society

Physics is not just knowledge which is applied only in laboratory or classrooms but well-organized studies of nature. So, everything happening around us is governed by the same set of Physics laws that students should learn how to explain it by what they had learnt.

## **(b) Reading comprehension**

This is a new type of question which will be included in Paper 1 of the HKCEE Physics Examination from 2005 onwards. Candidates are required to read a short passage of about 200~300 words about daily life Physics, historical and current developments in Physics or science and technology in society. The passage is followed by a few questions.

Some answers may be found in the passage but most of them require candidates' knowledge of Physics as well as their common sense. Little calculation is required while most answers are expected to be given in a sentence or short paragraph. In addition, they should make it a habit to read the newspaper everyday and pay attention to topics related to traffic accidents, electricity in society, energy, natural disasters and current developments in technology, etc.

# Distribution of

Topic \ Year	1992	1993	1994	1995	1996	1997	1998
Heat	4	4	—	6	—	4	—
Position and Movement	1(b, c, d)	1(ai, bii-v)	—	1(ci, ii)	2(a, b, d)	1(3aii)	1(a, ci, ii)
Force and Motion	2c	1a, 2d	1(a-c)	—	2c, 3a	3(aii, b, c)	1(b, ci, iii, d)
Work, Energy and Power	2a	2(aiii, b-d)	—	1(a, b)	3(b, ci)	3aii3	1(ciii, d), 2bii
Momentum	—	—	2(a, b, d)	2	—	—	2(bi, d)
Nature and Properties of Waves	—	—	5	—	4(ai-iii, v)	2	—
Light	3	3	3	3	1	—	3(b, c)
Sound	—	—	—	—	4b	—	—
Electricity	5	—	—	5a	—	7a	4
Electromagnetism	—	5	—	5b	7	7b	5
Atomic Physics	7(aii, b)	7	6(d, e)	7	6	6(a, c-e)	6(c, d)

# Exam Questions

Topic \ Year	1999	2000	2001	2002	2003	2004	2005
Heat	2	8	6c, 9a	2, 9(a, bii, cii, iv),	—	8	3, 11(a, b)
Position and Movement	7	7(a, bi, ii)	8	8(b, cii, iv)	11(ai, bi, iii)	7a	1, 13(a, b)
Force and Motion	7d	7biii	8(biii, c)	11(aii, iii)	—	2, 7ci	13(c, d)
Work, Energy and Power	3b	3(a, b)	1b	—	10d	2, 7(b, cii, di)	2
Momentum	3a	—	—	—	3b, 11bii	—	—
Nature and Properties of Waves	10	9	4, 6b	4, 5	2ai	4, 5	5, 6
Light	5, 8, 10	1	3, 6(a, b), 7(ai, ii, iv, b)	1, 11	1, 2, 5	1, 4, 11	4, 10(a, c)
Sound	—	9c	6(a, b)	5	5, 7	—	—
Electricity	1	8bi, 10(aii-iv, b)	5b, 9b, 10b	7(a, b)	8(b, c), 10(a, c, e)	—	9, 11c
Electromagnetism	4	6	5	6b	6	10c	10b, 12
Atomic Physics	6	11(aii-iii, bi, iii-iv)	11(a-c)	10(b, c)	9(a, b, cii)	9(b-e)	7, 8

# 8 Sound

## Review

### 8.1 Wave nature of sound

#### Sound is a longitudinal wave

- The direction of vibration of air molecules is parallel to the travelling direction of the wave.
- Compression and rarefaction are present. The distance between two adjacent centres of compression is the wavelength of the sound.

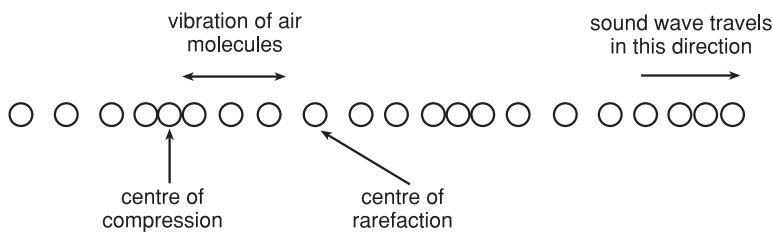


Figure 8.1

#### Speed of sound waves

- Sound waves can only travel through a medium. They cannot travel through a vacuum.
- Sound speed in common materials are listed below:

Medium	Speed of sound / $\text{m s}^{-1}$
Air ( $0^\circ\text{C}$ )	330
Air ( $20^\circ\text{C}$ )	340
Water ( $20^\circ\text{C}$ )	1500
Wood	4000
Steel	6000

Table 8.1

**Suggested Answer**

- (a) Microwaves are strongly reflected by rock and sand. 1  
They cannot penetrate the ground. 1
- (b) Since the wave is refracted towards the normal, 1  
the wave speed decreases when entering the elliptical region. 1  
So the region should be sand or shale. 1
- (c) The nature of the rock underground and 1  
the depth of the rock. 1

9. Read the following passage about noise barriers and answer the questions that follow: **Living Physics** **Extension**

### Use of noise barriers against noise pollutions

In June, 2003, the Hong Kong Highways Department (路政署) decided to clear away the noise barriers along the Tolo Highway. This situation brought controversy from the media and residents near the Tolo Highway, because the noise barrier is an important measures to protect residents by noise generated from the traffic. A noise barrier or acoustic shield reduces noise by interrupting the propagation of sound waves. With proper design and selection of material for the noise barrier or acoustic shield, the noise reaching a receiver would be primarily through diffraction over the top and around the ends of the barrier, there would be no direct propagation to receivers.

The acoustical "shadow zone" created behind the barrier is where noise levels are substantially lowered. To function well, the barrier must obstruct the line-of-sight between the noise source and the receiver. Effective noise barriers can reduce noise levels by as much as 20 dB. Vertical barriers (see Figure 8.12) and cantilever barriers (see Figure 8.13) are two common types of noise barriers used in Hong Kong.

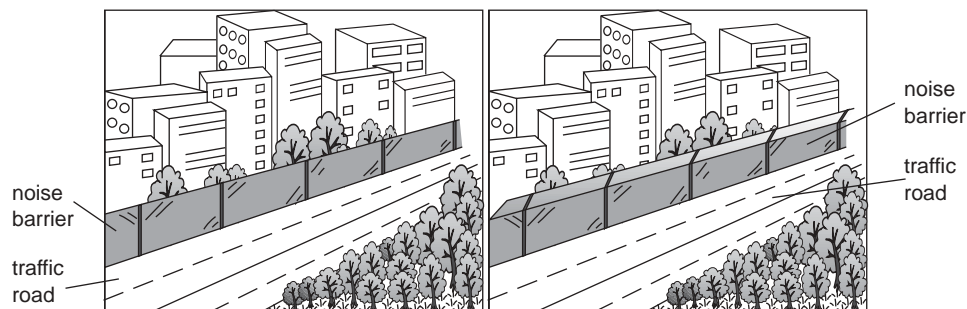


Figure 8.12

Figure 8.13

Barriers in Hong Kong are about 8 m high and are usually made of transparent plastic board. The cantilever type functions better than the vertical type. If space is adequate, the cantilever type is used.

23. Read the following passage about building designs for traffic noise reduction and answer the questions that follow: **Living Physics** **Extension**

### Building designs for traffic noise reduction

Attention to traffic noise is essential in site planning and building design. There are several ways noise can be reduced. The most obvious is to maintain distance between the source of the noise and the house, but this is not practicable in places of high population density like Hong Kong.

Siting the building downhill from the noise source or using a continuous wall of buildings, with minimal or no gaps between them, as a noise barrier may also reduce the effect of noise. Buildings positioned at an angle to the noise source should be avoided, as they will reflect noise onto the others. Balconies, offsets and landscaping can be used to reduce inter-reflection between parallel buildings (see Figure 8.34).

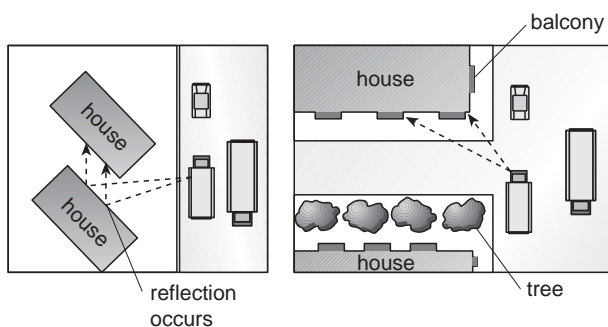


Figure 8.34



Figure 8.35

Buildings should be sited in a manner which:

- minimizes noise entering the buildings
- provides an acoustic barrier for private and communal open space
- reduces reflection of noise onto other buildings.

Podiums (see Figure 8.35) here frequently used to reduce noise in Hong Kong. They serve as an acoustic barrier between the residential buildings above them and the traffic noise; sound waves from the vehicles are blocked from reaching the upper levels.

- (a) As noise spreads upwards, buildings are sited downhill from the noise source to lower the effect of noise. Explain why noise spreads mainly upwards. (2 marks)
- (b) Explain why balconies and trees between buildings can reduce the inter-reflection of noise. (3 marks)
- \* (c) Can the podium completely shield the main building from the traffic noise? Explain briefly. **Hint 23** (5 marks)



12. An LCD monitor (see Figure 9.36) is a better choice than a CRT (cathode ray tube) monitor. The typical power of an LCD monitor is 17 W and that of a CRT monitor is 115 W in Hong Kong.



Figure 9.36

Living Physics

- (a) What is the mains voltage in Hong Kong? (1 mark)
- (b) Find the typical working current for an LCD monitor. (2 marks)
- (c) Explain why using an LCD monitor is safer than using a CRT monitor. **Hint 12** (2 marks)

13. Two light bulbs, each of rating '220 V 60 W', are connected in series to the mains.

Living Physics

- (a) Draw a diagram to show how they are connected. (1 mark)
- (b) Find the actual power consumed by each light bulb. **Hint 13** (3 marks)
- (c) On which wire should the switch be installed? (1 mark)
- (d) Explain why this method of connection is unsafe. (3 marks)

14. The rating of an electric lamp is '220 V, 200 W'. When the lamp is connected to the 220 V mains, the power output of the light bulb is 45 W.

Living Physics

- (a) Find the current delivered by the mains. (2 marks)
- (b) Choose a suitable fuse from the following fuses to protect the lamp:  
1 A, 2 A, 5 A, 13 A.  
Give a brief explanation for your choice. (2 marks)
- (c) The output power of the lamp is found to be lower than the rated power. Explain why. **Hint 14** (2 marks)



Figure 9.37

15. The electric appliances in a home are connected in parallel to the mains.

Living Physics

- (a) Give TWO reasons to explain why the appliances are connected in parallel instead of in series. **Hint 15** (2 marks)
- (b) Draw a diagram to show a ring circuit. Also draw two wall sockets in your diagram. Clearly show the connection between the ring circuit and the sockets. (3 marks)
- (c) The following three appliances are switched on 24 hours a day over 2 weeks. Calculate the cost of the electricity consumed if each kW h costs 90¢. (2 marks)

Appliances	Wattage
freezer	200 W
air-conditioner	2.5 kW
air purifier	300 W

Table 9.3

# PHYSICS PAPER 1

## Question-Answer Book (Mock Examination)

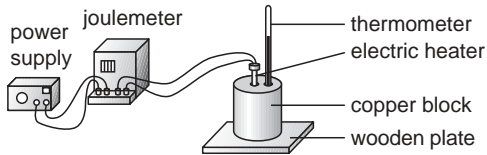
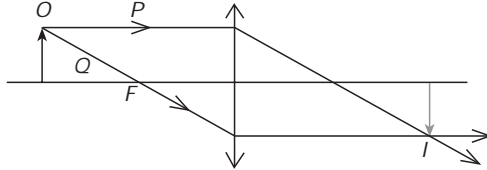
$1\frac{3}{4}$  hours

This paper must be answered in English

1. This paper consists of TWO sections, Section A and Section B. Section A carries 54 marks and Section B carries 36 marks.
2. Answer ALL questions in each section. Write your answers in the spaces provided in this Question-Answer Book. Supplementary answer sheets will be supplied on request. Write your Candidate Number on each sheet and fasten them with string inside this book.
3. Some questions contain parts marked with an asterisk (\*). In answering these parts, candidates are required to give paragraph-length answers. In each of these parts, one mark is allocated to assess candidates' ability in effective communication.
4. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
5. Take  $g = 10 \text{ m s}^{-2}$ .
6. Unless otherwise specified, all the cells are assumed to have negligible internal resistance.

## Question Commands

### Paper I Conventional Questions

	Question command(s)	Example(s)	Tips
1.	Find the ...	<p>1. Find the weight of a man of mass 65 kg. (1 mark)                      Ans:  <math>W = mg = 65 \times 10 = 650 \text{ N}</math> (1A)</p> <p>2. A car of mass 1200 kg moving at <math>20 \text{ m s}^{-1}</math> is brought to stop uniformly by a 800 N friction. Find the braking distance. (3 marks)                      Ans:                      Work against friction = change in K.E.                      or <math>F \times s = \frac{1}{2} mv^2</math> (1M)  <math>800 s = \frac{1}{2} \times 1200 \times 20^2</math> (1M)  <math>s = 300 \text{ m}</math> (1A)</p>	<ul style="list-style-type: none"> <li>The exact numerical answer is expected.</li> <li>1 mark question: a correct answer scores the mark</li> <li>2 marks question: 1 mark for the correct formula used and 1 mark for the answer*</li> <li>3 marks question: 1 mark for the correct formula or law applied, 1 mark for correct substitution of numerical values and 1 mark for the answer*</li> </ul> <p>* If the answer is correct, all the 'M' marks will be granted.</p>
2.	Draw a diagram ...	<p>Draw a diagram to show the experimental setup for the measurement of the specific heat capacity of copper.</p> <p>Ans:</p> 	<ul style="list-style-type: none"> <li>The diagram should be labelled properly. Wrong spelling will score no mark.</li> <li>If possible, use standard equipment/apparatus in the diagram.</li> </ul>
3.	Complete the diagram ...	<p>Complete the given diagram by adding the refracted rays of the incident rays P and Q. Hence locate the image formed.</p> <p>Ans:</p> 	<ul style="list-style-type: none"> <li>Add lines, shapes or apparatus to the given diagram.</li> </ul>