Exam Paper Format

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

<table>
<tr><th></th><th colspan="2">Paper 1</th><th colspan="2">Paper 2</th></tr>
<tr><td>Types of questions</td><td colspan="2">Conventional questions</td><td colspan="2">Multiple-choice questions</td></tr>
<tr><td>Duration</td><td colspan="2">1 hour 45 minutes</td><td colspan="2">1 hour</td></tr>
<tr><td>Percentage share of the total marks</td><td colspan="2">60% — 36% (Section A)
24% (Section B)</td><td colspan="2">40%</td></tr>
<tr><td rowspan="2">Details of the papers</td><td rowspan="2"><u>Section A</u>
• 8 to 10 compulsory short questions from the core syllabus
• Each question consists of 2 to 3 parts</td><td rowspan="2"><u>Section B</u>
• 3 to 5 compulsory long questions from the whole syllabus
• Each question consists of 5 to 6 parts</td><td><u>Section A</u>
• 25 to 30 compulsory questions from the core syllabus</td><td><u>Section B</u>
• 15 to 20 compulsory questions from the whole syllabus</td></tr>
<tr><td colspan="2">• Totally consist of 45 multiple-choice questions.
• Four options will be provided in each question</td></tr>
</table>

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	• Reflection by curved mirrors • Optical instruments: magnifying glass, microscope, telescope, human eye, camera	——
Heat	• Gas laws, Kinetic theory	• Transfer process of heat (conduction, convection and radiation)
Mechanics	• Pressure as force per unit area • Moment produced by a force • Machine	——
Waves	• Standing (stationary) waves • Viewing water wavefront by stroboscope	• Using the unit decibel to represent the sound intensity level • Noise pollution and acoustic protection
Electricity and Magnetism	• CRO, electronic devices, logic gates • Charging by using an E.H.T power supply	——
Atomic Physics	• α-particle scattering experiment	• Using sievert as a unit to measure radiation dosage • Nuclear fusion and solar energy

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
Heat	2	8	6c, 9a	2, 9(a, bii, cii, iv),	—	8
Position and Movement	7	7(a, bi, ii)	8	8(b, cii, iv)	11(ai, bi, iii)	7a
Force and Motion	7d	7biii	8(biii, c)	11(aii, iii)	—	2, 7ci
Work, Energy and Power	3b	3(a, b)	1b	—	10d	2, 7(b, cii, di)
Momentum	3a	—	—	—	3b, 11bii	—
Nature and Properties of Waves	10	9	4, 6b	4, 5	2ai	4, 5
Light	5, 8, 10	1	3, 6(a, b), 7(ai, ii, iv, b)	1, 11	1, 2, 5	1, 4, 11
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)	—
Electromagnetism	4	6	5	6b	6	10c
Atomic Physics	6	11(aii-iii, bi, iii-iv)	11(a-c)	10(b, c)	9(a, b, cii)	9(b-e)

6 Nature and Properties of Waves

Review

6.1 Nature of waves

Wave nature

- A wave is a disturbance that travels from one location to another. The disturbance is the oscillation of particles in a medium.

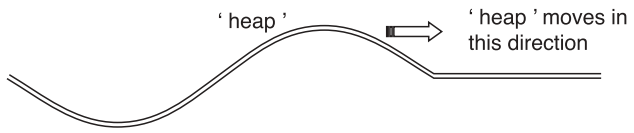


Figure 6.1

- When a series of disturbances are travelling from one location to another, all the particles in the medium are oscillating at the same time but at different ‘paces’. None of them travels in the direction of the wave propagation.

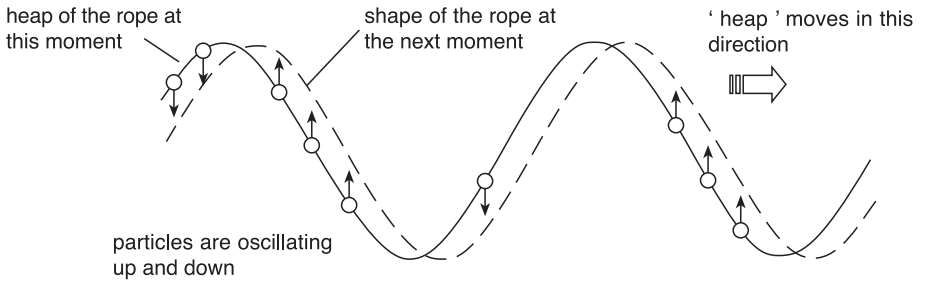


Figure 6.2

- A wave is a way of transmitting energy, in the form of a disturbance, through some medium without translocation of the medium.
- When a wave propagates, the particles in the medium are just oscillating about their own original positions.

Transverse and longitudinal travelling waves

- There are two ways to generate a wave in a medium.

Suggested Answer

Divide the heating process into three parts:

1. Temperature of ice increases from –15°C to 0°C.

Heat required = $Q_1 = mc\Delta T = 0.4 \times 2100 \times [0 - (-15)]$ 1

$= 12\,600$ J 1

2. Ice at 0°C turns to water at 0°C.

Heat required = $Q_2 = mL_f = 0.4 \times 3.34 \times 10^5$ 1

$= 133\,600$ J 1

3. Temperature of water increases from 0°C to 80°C.

Heat required = $Q_3 = mc\Delta T = 0.4 \times 4200 \times (80 - 0)$

$= 134\,400$ J

$\therefore$ Total heat required = $Q_1 + Q_2 + Q_3$

$= 280\,600$ J 1

7. Read the following article from the promotion brochure of a multi-purpose electric cooker and answer the questions that follow: Living Physics

Directions for the multi-purpose electric cooker

This multi-purpose electric cooker grills meat, steams vegetables, or pan-fries fish—whatever you are in the mood to eat. The cooker runs at 1,000 watts and has a thermostat（自動調溫器）with a wide temperature range that starts at a keep-warm function and goes all the way up to 250 ℃.

The cooking basket is coated with durable nonstick titanium for a quicker clean-up. In addition, the cooking basket will heat up very quickly so as to maintain it high efficiency.

Figure 1.19

The hot plate, cooking basket, and glass lid are all dishwasher safe. This cooker is easy to transport, it measures 28 centimetres across, 18 centimetres high and weighs 3.5 kg.

(a) Suggest a suitable temperature for the cooker to keep some soup warm. Explain briefly. (3 marks)

(b) The inner plate heats up very quickly. What physical property does it possess? Explain why it can ensure a high working efficiency. (3 marks)

(c) Give two reasons why the lid is made of glass. (4 marks)

Guidelines

For a high working efficiency, heat gained by the cooker should be lower than that of the food.

10. Figure 5.23 shows a traffic accident. A taxi runs into a bus which is initially at rest. After impact, the two vehicles are locked together and they move for a distance of 3 m. It takes 0.4 s for the vehicles to lock and 1.8 s to cover the 3 m distance. The frictional force between the locked cars and the ground is 24 300 N.

Living Physics

Figure 5.23

By measurement after the accident, the following data were obtained:

mass of the taxi = 1450 kg

mass of the bus = 5850 kg

(a) Find the velocity of the locked cars just after impact. (3 marks)

(b) What is the initial velocity of the taxi just before impact? (3 marks)

(c) Find the average force exerted on the bus during impact. (2 marks)

(d) Suggest two safety measures to protect the passenger inside a vehicle if an impact is from the side. Hint 9 (2 marks)

11.

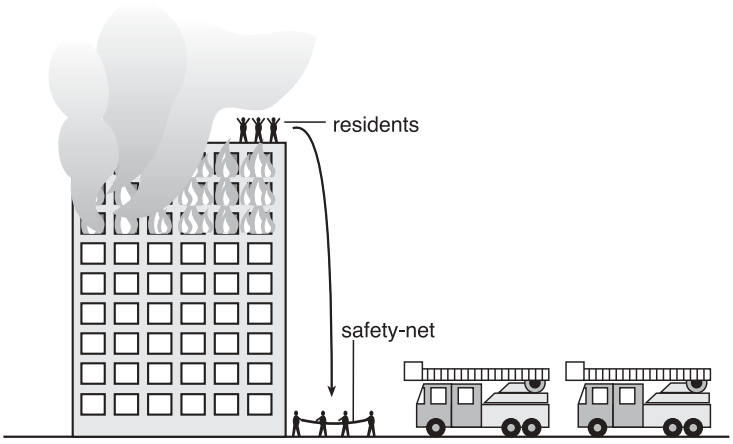


Figure 5.24

A tall building with a height of 131 m is on fire and the residents escape to the top of the building. The firemen on the ground open a safety net 1 m from the ground for the residents to jump onto.

(a) Peter is one of the residents who is going to jump down to the net. His mass is 60 kg. Find

(i) his velocity on reaching the safety net; and (2 marks)

(ii) his momentum at the moment of reaching the safety net. (2 marks)

(b) He comes to rest 1 second later. Calculate

(i) the change in his momentum; and (1 mark)

(ii) the force exerted on his body. (1 mark)

(c) Determine Peter's velocity if he lands on the ground without the safety net. (1 mark)

21. Read the following passage about volleyball and answer the questions that follow: Living Physics

Momentum and collisions in volleyball

Figure 5.41

In volleyball, there are two types of momentum. First is the emotional momentum possessed by one of the teams which frightens the opponents. And the second one is the kind that relates to physics.

No matter what the collisions are, momentum is conserved. There are five techniques, involving an inelastic collision which happen frequently in volleyball, namely: serving（發球）, defending（墊球）, setting（傳球）, spiking（扣球） and blocking（攔網）. An elastic collision is preferred in serving, spiking and blocking.

In setting, the player uses his fingers to wrap around the ball and cushion it up with a swift motion of his wrists. In spiking, the player needs to swing his arm back as far as possible. Then he swings his arm at full speed toward net and hits the ball into the opponent's court.

(a) Explain why an elastic collision is preferred in serving, spiking and blocking. Hint 26 (2 marks)

(b) In setting, the player should retract his wrists so as to extend the time of contact with the ball. Give two reasons to explain why. (2 marks)

(c) In spiking, the player has to swing his arm back as far as possible before hitting the ball. In doing so, the ball can be spiked at a high speed. Explain why by means of conservation of energy. Hint 27 (3 marks)

CE
PHY
PAPER 1

PHYSICS PAPER 1

Question-Answer Book

(Mock Examination)

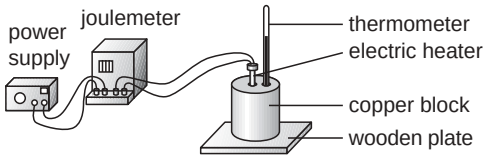
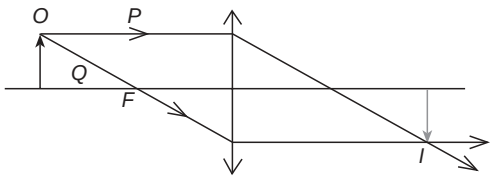
$1\frac{3}{4}$ hours

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 ...	1. Find the weight of a man of mass 65 kg. (1 mark) Ans: $W = mg = 65 \times 10 = 650$ N (1A) 2. A car of mass 1200 kg moving at 20 m s^{-1} 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 $F \times s = \frac{1}{2}mv^2$ (1M) $800\ s = \frac{1}{2} \times 1200 \times 20^2$ (1M) $s = 300$ m (1A)	• The exact numerical answer is expected. • 1 mark question: a correct answer scores the mark • 2 marks question: 1 mark for the correct formula used and 1 mark for the answer* • 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* * If the answer is correct, all the 'M' marks will be granted.
2.	Draw a diagram ...	Draw a diagram to show the experimental setup for the measurement of the specific heat capacity of copper. Ans:  	• The diagram should be labelled properly. Wrong spelling will score no mark. • If possible, use standard equipment/apparatus in the diagram.
3.	Complete the diagram ...	Complete the given diagram by adding the refracted rays of the incident rays *P* and *Q*. Hence locate the image formed. Ans:  	• Add lines, shapes or apparatus to the given diagram.