Public Assessment of the HKDSE Physics Examination

1. Public Assessment

The public assessment of the Hong Kong Diploma of Secondary Education (HKDSE) Physics Exam consists of a public examination component and a school-based assessment component.

A. Public Examination component

In Physics, the mark of the public examination component contributes 80% of the final subject mark.

| Paper	Section	Question types	Weighing	Duration	Curriculum
Paper 1	Section A	Multiple-choice Questions	21%	2 hours 30 minutes	Compulsory Part
	Section B	Short Questions and Structured / Essay-type Questions	39%		
Paper 2	–	Multiple-choice Questions and Structured Questions	20%	1 hour	Elective Part (2 out of 4)

B. School-based Assessment component

In Physics, students are assessed by their teachers on their performance of a wide range of skills involved in practical and non-practical related tasks throughout S.5 and S.6. The mark of the school-based assessment component contributes 20% of the final subject mark.

Year of examination	Assessment types	Weighing
2012 and 2013	Practical related component	20%
Starting from 2014	Practical related component	18%
	Non-practical related component	2%

2. Standards-referenced Reporting

The HKDSE makes use of standards-referenced reporting, which means candidates' levels of performance will be reported with reference to a set of standards as defined by cut scores on the variable or scale for a given subject. The following diagram represents the set of standards for a given subject:
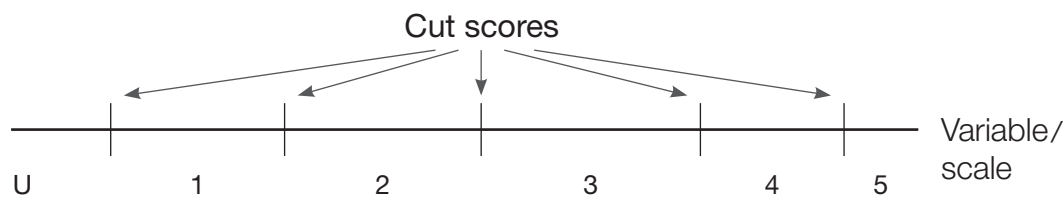
Within the context of the HKDSE there will be five cut scores, which will be used to distinguish five levels of performance (1–5), with 5 being the highest. The Level 5 candidates with the best performance will have their results annotated with the symbols ✱✱ and the next top group with the symbol ✱. A performance below the threshold cut score for Level 1 will be labelled as 'Unclassified' (U).

Exam Strategies

A. Time Allocation

Paper 1 (Compulsory Part) —— 2 hours 30 minutes

Section	Suggested Time Allocation	Approximate Time per Question
A	60 minutes	1.5 minutes
B	90 minutes	5 – 10 minutes

– Allow 5 minutes for final checking.

Paper 2 (Elective Part) —— 1 hour

Time Allowed	Approximate Time per Question
60 minutes (answering 2 out of 4 questions)	25 – 30 minutes

– Allow 5 minutes for final checking.

B. Answering Skills

- Pay attention to the units in calculation, especially in the conversion between
  - kg, g, mg and μg,
  - km, m, cm, mm, μm and nm,
  - year, day, h, min, s, ms and μs.
- Take $g = 9.81$ m s^{-2} in all questions. Look up the numerical values of the constants and formulae that you need at the last two pages of the exam paper.

Paper 1A   Multiple-choice Questions

- Make your draft next to each question so that the draft can be referenced during final checking.
- Mark only ONE answer for each question.
- The statements in the options may be misleading. DO NOT spend too much time in reading the options.
- DO NOT leave any questions unanswered even if you do not know the answer.

Paper 1B   Short Questions and Structured / Essay-type Questions

- Skip the questions that you do not have confidence on. Go back to those questions after you have finished the others.
- The units of physical quantities must be written. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
- In answering questions involving calculations, show your steps rather than just writing down the answers. In case you do not get the correct answer, you can get marks for the correct methods used.
- In answering questions involving drawing:
  - Always use a pencil.
  - Draw diagrams and graphs with tools like rulers.
  - Choose an appropriate scale.
  - Name the apparatus used. / Name all forces. / Label the axes.

Common Mistake Analysis

Physical Quantities

Make sure that you are familiar with the meanings of all physical quantities, such as:

**(a) Temperature difference ΔT in mixing up two liquids**

200 g of water at 80°C is mixed with 800 g of water at 20°C. Let T be the final temperature of the mixture, where 20°C $< T <$ 80°C.

$$0.2 \times c \times (80 - T) = 0.8 \times c \times (T - 20) \qquad \blacktriangleleft \text{ It is incorrect to write } (T - 80).$$
$$16 - 0.2T = 0.8T - 16$$
$$T = 32°C$$

(b) Length of the wire segment l in a magnetic field B

An aluminium rod of length 12 cm is placed inside a uniform magnetic field of 0.6 T as shown. When a current of 0.2 A flows through the rod, the magnetic force F acting on the rod is

$$F = IlB$$
$$= 0.2(0.08)(0.6) \qquad \blacktriangleleft \text{ The length inside the magnetic field is not 12 cm.}$$
$$= 0.0096 \text{ N}$$

copper rail

12 cm   8 cm

B-field

aluminium rod
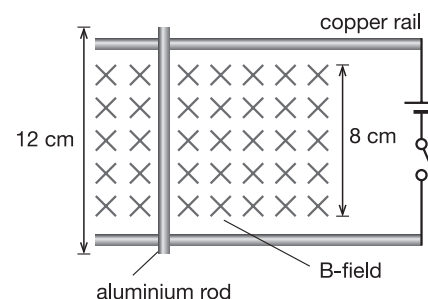
Key Concepts

Make sure that you are familiar with all physical concepts, such as:

(a) The direction of resultant force in horizontal circular motion

A small ball of mass 40 g is hung by an inextensible light string of 24 cm long and set to perform a horizontal uniform circular motion with 2.5 revolutions per second. The tension T in the string is

$$T \sin\theta = mr\omega^2 \qquad \blacktriangleleft \text{ Resolve the tension in the string and relate the horizontal component with centripetal force.}$$
$$= m(L\sin\theta)\omega^2$$
$$T = mL\omega^2$$
$$= 0.04(0.24)(2\pi \times 2.5)^2$$
$$= 2.37 \text{ N}$$

(b) The properties of refraction (not only a change in the angle of refraction)

In which of the following cases does refraction occur?

(1) A white light strikes the air-glass boundary of a glass prism.
(2) A series of sound waves propagates vertically downwards from the air to the sea.
(3) A series of water waves travels towards a coast.
    A. (1) and (2) only
    B. (1) and (3) only
    C. (2) and (3) only
    D. (1), (2) and (3)

Ans: D

Explanation: At normal incidence, although the angle of refraction is also 0°, the speed of the series of sound waves changes as it propagates into the sea.

2012 HKDSE Exam and Mock Exam Questions Distribution

Paper 1 (Compulsory Part)

Paper 1A consists of 36 MC questions. Paper 1B consists of 11 – 14 questions.
Distribution of Exam Questions:

		2012 HKDSE		Mock 1	
		Section A	Section B	Section A	Section B
I.	Heat and Gases	1, 2, *3, 4	1, *2	1, 2, *3, *4	1(c), 2, 3(a),(b),*(c)
II.	Force and Motion	5 – 11, *12, 13, *14	*3, 4, 5(a),*(b)	5 – 12, *13, *14	1(a),(b), 4, *5, 6(a), *(b),*(c), *7
III.	Wave Motion	15 – 19, *20, 21 – 23	6(a) – (c), *(d), 7(a), (b)*(i), (ii)	15 – 19, *20, *21, 22, 23	8, 9, 10
IV.	Electricity and Magnetism	24, *25, 26 – 33	8(a) – (c), *(d), 9(a),(b),*(c), 10	24, *25, 26 – 30, *31, *32, *33	11, 12, 13
V.	Radioactivity and Nuclear Energy	34 – 36	11(a),*(b),(c)	*34, 35, 36	14

*Questions marked with * involve knowledge of the extension component.*

Paper 2 (Elective Part)

There are 4 sections in Paper 2, each consists of 8 MC questions and a structured question. These questions fully cover the contents in each elective topic.

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PHYSICS MOCK EXAM 5
PAPER 1

Time allowed: 2 hours 30 minutes
This paper must be answered in English.

GENERAL INSTRUCTIONS

1. There are **TWO** sections, A and B, in this Paper. You are advised to finish Section A in about 60 minutes.

2. Section A consists of multiple-choice questions in this question paper, while Section B contains conventional questions printed separately in Question-Answer Book **B**.

3. Answers to Section A should be marked on the Multiple-choice Answer Sheet while answers to Section B should be written in the spaces provided in Question-Answer Book **B**. **The Answer Sheet for Section A and the Question-Answer Book for Section B will be collected separately at the end of the examination.**

4. The diagrams in this paper are **NOT** necessarily drawn to scale.

5. The last two pages of this question paper contain a list of data, formulae and relationships which you may find useful.

INSTRUCTIONS FOR SECTION A (MULTIPLE-CHOICE QUESTIONS)

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.

2. When told to open this book, you should check that all the questions are there. Look for the words '**END OF SECTION A**' after the last question.

3. All questions carry equal marks.

4. **ANSWER ALL QUESTIONS**. You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.

5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

6. No marks will be deducted for wrong answers.

Not to be taken away before the
end of the examination session

Section A

There are 36 questions. Questions marked with * involve knowledge of the extension component.

1. Four different liquids of equal mass are cooled from the same temperature at the same place for some time. Which liquid has the highest freezing point?
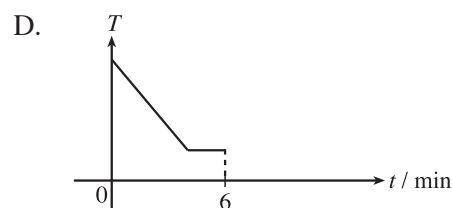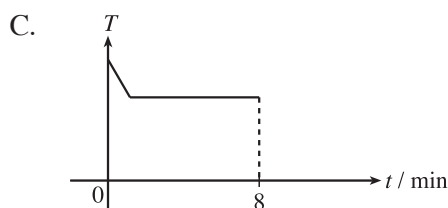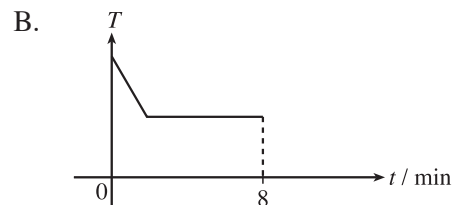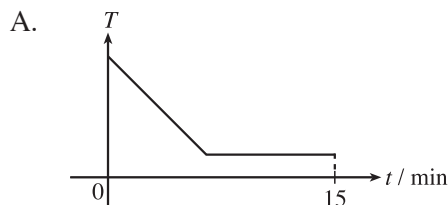
2. Which of the following can be explained by the high specific heat capacity of water?

    (1) The body temperature is regulated by sweating.
    (2) The coastal climate is mild compared with inland areas on the same latitude.
    (3) Water is used as a coolant in power stations.

    A. (1) only
    B. (3) only
    C. (1) and (2) only
    D. (2) and (3) only

*3. Some gas is trapped inside a vessel of fixed volume. If the vessel is heated from 20°C to 120°C, what will be the percentage increase in the gas pressure?

    A. 20.0%
    B. 34.1%
    C. 100%
    D. 500%

*4. In order to demonstrate the pressure law on nitrogen gas, which of the following precautions should be implemented?

    (1) The gas temperature should be varied in a high temperature range.
    (2) The volume should be kept constant.
    (3) The pressure should be increased uniformly.

    A. (1) only
    B. (3) only
    C. (1) and (2) only
    D. (2) and (3) only

B

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Candidate Number									

PHYSICS MOCK EXAM 5 PAPER 1

SECTION B: Question-Answer Book B

This paper must be answered in English.

INSTRUCTIONS FOR SECTION B

1. After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5 and 7.

2. Refer to the general instructions on the cover of the Question Paper for Section A.

3. Answer **ALL** questions.

4. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.

5. Graph paper and supplementary answer sheets will be provided on request. Write your Candidate Number, mark the question number box and stick a barcode label on each sheet, and fasten them with a string **INSIDE** this Question-Answer Book.

6. No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.
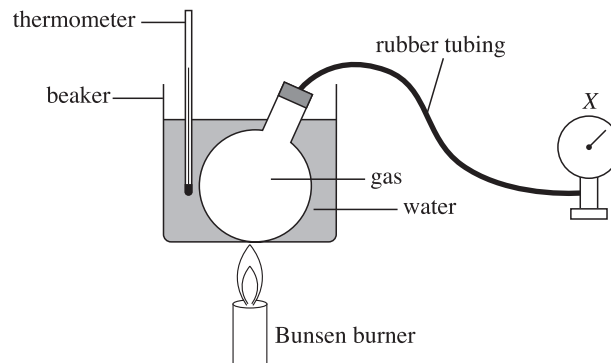
Question No.	Marks
1	6
2	7
3	7
4	7
5	5
6	6
7	5
8	5
9	8
10	7
11	6
12	7
13	8

1.

Figure 1.1

The above experimental set-up is used to study the pressure-temperature relation of a gas. The gas pressure inside the flask is measured by a device X. The temperature is measured in Celsius scale.

*(a) Name the device X.   (1 mark)

_____

_____

*(b) Identify the TWO serious mistakes in the set-up.   (2 marks)

_____

_____

_____

_____

Page total

PHYSICS MOCK EXAM 5 PAPER 2
Question-Answer Book

Time allowed: 1 hour
This paper must be answered in English.

Please stick the barcode label here.

Candidate Number

INSTRUCTIONS

1. After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5 and 7.

2. This paper consists of **FOUR** sections, Sections A, B, C and D. Each section contains eight multiple-choice questions and one structured question which carries 10 marks. Attempt **ALL** questions in any **TWO** sections.

3. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked. For multiple-choice questions, blacken the appropriate circle with an HB pencil. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

4. Graph paper and supplementary answer sheets will be provided on request. Write your candidate number, mark the question number box and stick a barcode label on each sheet, and fasten them with a string **INSIDE** this Question-Answer Book.

5. The diagrams in this paper are **NOT** necessarily drawn to scale.

6. The last two pages of this Question-Answer Book contain a list of data, formulae and relationships which you may find useful.

7. No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

Section A: Astronomy and Space Science

Q.1:   Multiple-choice questions

1.1
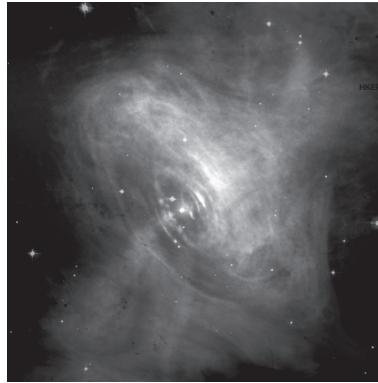
The figure above shows the Crab Nebula. It is

A. interstellar clouds of gas and dust.	A	B	C	D
B. a solar system.	○	○	○	○
C. a cluster of stars.				
D. a cluster of galaxies.				

1.2   Stars in the north celestial sphere appear to move around the Polaris because

A.   all stars are orbiting around the Polaris.
B.   the Earth is orbiting around the Sun.
C.   the Earth is rotating about an axis which passes the Polaris.
D.   stars in the local group are moving around the centre of the local group.

A   B   C   D
○   ○   ○   ○

1.3   According to the Ptolemaic geocentric model, retrograde motion of Mars

A.   can only be explained by the motion around deferent.
B.   can only be explained by the motion around epicycle.
C.   can be explained by the motion around both deferent and epicycle.
D.   can neither be explained by the motion around deferent nor epicycle.

A   B   C   D
○   ○   ○   ○

1.4   Which of the following was not included in Copernican model?

A. The Sun does not orbit around the Earth.	A	B	C	D
B. The Earth is orbiting around the Sun.	○	○	○	○
C. The Moon is orbiting around the Earth.				
D. Planets orbit around the Sun in elliptical paths.				

Mock Exam 1
Paper 1

Section A

1. **D**

    The average kinetic energy of the molecules in a substance is closely related to its temperature, whereas the potential energy of the molecules is closely related to the state of the substance. The kinetic energy of each individual molecule is due to its random motion. The increase in the kinetic energy of a molecule may vary, but the total kinetic energy and the average kinetic energy of the molecules is doubled when the Kelvin temperature is doubled.

    > **Don't forget!**
    > Internal energy includes kinetic energy and potential energy.

2. **C**

    $$Total\ heat\ released = 0.005 \times (2.268 \times 10^6) + 0.005 \times 4200 \times (100 - 80)$$
    $$= 11\ 760\ J$$

3. **B**

    Equation of state for an ideal gas:
    $$pV = nRT$$
    $$n = \frac{pV}{RT}$$
    $$\therefore \quad n_1 = \frac{400}{RT} \ and\ n_2 = \frac{150}{RT}$$
    Since $n = n_1 + n_2$,
    $$\frac{p(400)}{RT} = \frac{400}{RT} + \frac{150}{RT}$$
    $$400\,p = 550$$
    $$p = 1.38\ atm$$

    > **Don't forget!**
    > The sum of the numbers of molecules before mixing is equal to the number of molecules at the final state.

    > **Strategies**
    > Express n_1 and n_2 in terms of common constants and values.

4. **C**

    For (1):
    A higher temperature refers to a higher average speed of the molecules.
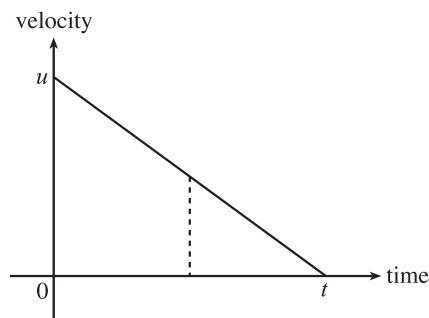   For (2):
    Since the volume of the ball and the number of molecules in the ball are kept constant, the separation between the molecules remains unchanged.
    For (3):
    Since the average speed of the molecules increases, the molecules collide with the inner wall of the ball more violently and frequently. Therefore, the average force exerted on the inner wall increases.

    > **Don't forget!**
    > Since the ball is heated up, the temperature increases.

5. **B**

    Refer to the following velocity-time graph.

    > **Don't forget!**
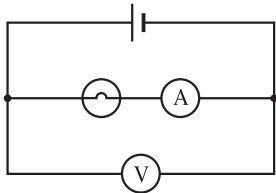   > At the highest point, the instantaneous velocity is zero.

    > **Don't forget!**
    > For uniformly accelerated motion, the distance travelled can be found by the area under the velocity-time graph.

Level Boosting Examples

Level 2 answer 👎 ....

9. Circuit diagram:

- • Ammeter connected in series and voltmeter connected in parallel   1A

Close the switch. Record the readings *V* and *I*.   1A

Repeat the measurement by using two dry cells.

Investigate the *V-I* relationship. Calculate the resistance from the readings *V* and *I*. The two sets of data give the same resistance *R*.

Boost Your Level

Understand the different ways of connecting a voltmeter and an ammeter in different situations.

Use the proper apparatus to help take several sets of measurements during an experiment.

Recall the graphical technique used in investigation.

✔ Level Analysis

This response shows that the candidate has a basic knowledge of current electricity involved in this question.

The candidate is able to connect an ideal voltmeter and an ideal ammeter for a single measurement. However, the candidate does not know that the resistance of the light bulb is small and is comparable to that of the ammeter. The candidate also fails to take several sets of data using the given apparatus. In addition, the candidate presumes that the *V-I* relationship is linear without prior investigation. In general, this response reveals that the candidate has very limited knowledge of investigation using the graphical technique.

Level 5 answer 👍 ....

9. Circuit diagram:
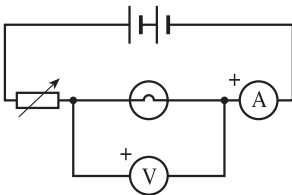
- • Ammeter connected in series and voltmeter connected in parallel   1A
- • All correct (voltmeter connected across light bulb only)   1A

Set the variable resistor at the smallest value. Record the readings *V* and *I* of the voltmeter and the ammeter.   1A

Repeat the measurement by setting the variable resistor at different values. Record the corresponding readings of the two meters.   1A

Plot a graph of *V* against *I* to represent the *V-I* relationship.   1A

10. (a) The half-rings reverse the way of connecting the coil to the external circuit   1A
    whenever the coil passes the vertical position.   1A
    This ensures that the moment produced by the magnetic forces remains in the same
    direction. The coil can continue to rotate.   1A

✔ Level Analysis

This response shows that the candidate has a good understanding of current electricity involved in this question.

The candidate is able to connect the voltmeter and the ammeter for the measurement of a small resistance. The candidate is also able to take several sets of data using the given apparatus. In general, this response reveals that the candidate has adequate knowledge of investigation using the graphical technique.