香港考試及評核局
HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

香港中學文憑考試
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION

練習卷
PRACTICE PAPER

物理　試卷一
PHYSICS　PAPER 1

評卷參考(暫定稿)
PROVISIONAL MARKING SCHEME

本評卷參考乃香港考試及評核局專爲本科練習卷而編寫，供教師參考之用。教師應提醒學生，不應將評卷參考視爲標準答案，硬背死記，活剝生吞。這種學習態度，既無助學生改善學習，學懂應對及解難，亦有違考試着重理解能力與運用技巧之旨。因此，本局籲請各位教師通力合作，堅守上述原則。

This marking scheme has been prepared by the Hong Kong Examinations and Assessment Authority for teachers' reference. Teachers should remind their students NOT to regard this marking scheme as a set of model answers. Our examinations emphasise the testing of understanding, the practical application of knowledge and the use of processing skills. Hence the use of model answers, or anything else which encourages rote memorisation, will not help students to improve their learning nor develop their abilities in addressing and solving problems. The Authority is counting on the co-operation of teachers in this regard.

Section A

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

Section B Provisional Marking Scheme

General Notes for Teachers on Marking

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2. The marking scheme may not exhaust all possible answers for each question. Teachers should exercise their professional discretion and judgment in accepting alternative answers that are not in the marking scheme but are correct and well reasoned.

3. In the marking scheme, marks are classified as follows :

   'M' marks – awarded for knowing a correct method of solution and attempting to apply it. (Candidates are not expected to write down the formula/method explicitly, marks could be awarded once candidates' work indicated that the particular formula/method had been used.)

   'A' marks – awarded for the accuracy of the answer. (For non-numerical answers, the answers need not be in exact wording as those in the marking scheme.)

   In a question consisting of several related parts, 'M' marks should be awarded to steps or methods correctly deduced from erroneous answers obtained in earlier parts. However, 'A' marks for the corresponding numerical answer should **NOT** be awarded.

4. In questions involving numerical computations, if a candidate's answer clearly indicated that a wrong method had been used (e.g. the application of a wrong formula), the 'A' marks should not be awarded even if the candidate had accidentally arrived at the correct numerical answer. In case of doubt, the benefit should be given in the candidate's favour.

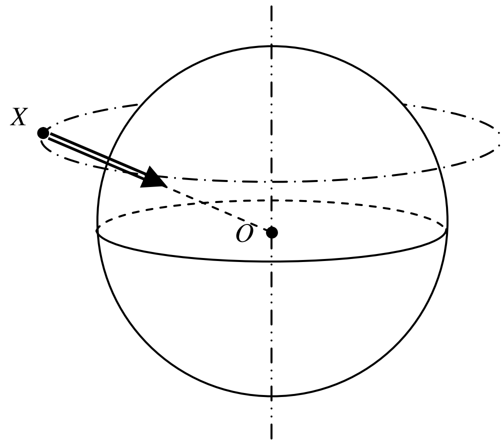
5. If the unit had been stated wrongly in the final numerical answer of a question, or if it had been omitted completely, no 'A' marks should be awarded to the final answer. However, candidates should not be penalised twice in the whole paper for the same error in that unit.

6. In questions asking for a specified number of reasons or examples etc. to be given and a candidate gave more than that is required, the surplus answers should not be marked. For example, in a question asking for two examples, if three had been given by a candidate, then only the first two answers should be marked.

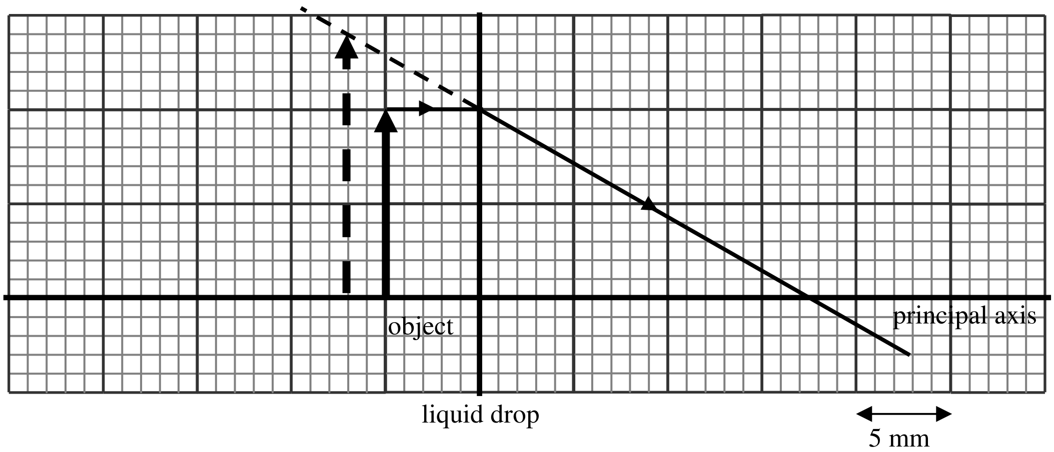
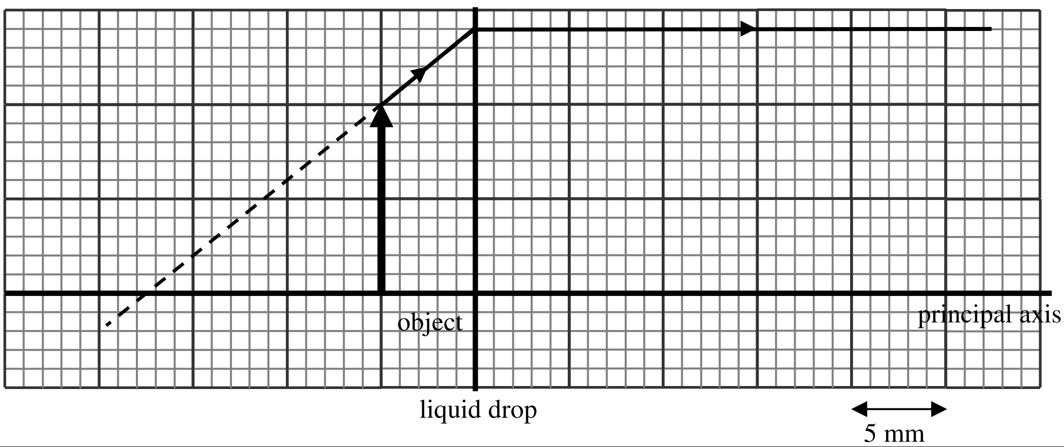
7. Markers could exercise their judgment to split the '2A' or '2M' marks (if any), i.e. to award 1 mark only, if the answer is partially correct.

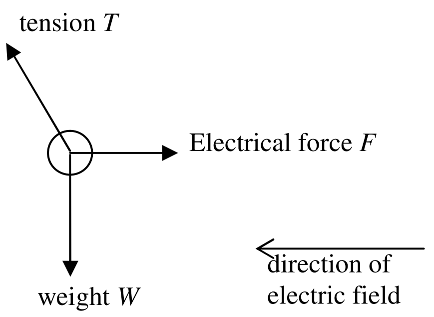
Solution	Marks	Remarks
1. (a) (i) A black surface is a good absorber of radiation.	1A	
(ii) A cover reduces heat loss due to convection of air.	1A	
(iii) The oil in the copper pipe inside the box is heated and rises.	1A	
Cooler and denser oil from the pipe in the storage tank will move downward and replace the heated oil.	1A	
	4	
(b) By $Pt = mc\Delta T$,	1M	
in 1 minute,		
$P \times 60 = 0.3 \times 2500 \times (37 - 25)$	1M	
$P = 150$ W	1A	
	3	
(c) The pressure increases with temperature.	1A	
As temperature increases, the average kinetic energy / speed of the air particles increases.	1A	
The air particles will hit the wall of the box more violently and more frequently.	1A	
	3	
2. (a) $a = 3/2 = 1.5$ m s^{-2}	1A	
By $T - mg = ma$		
$T - 4 \times 9.81 = 4 \times 1.5$	1M	
$T = 45.24$ N [46 N]	1A	
	3	
(b) Power $= Fv$		
$= 4 \times 9.81 \times 3$	1M	
$= 117.72$ W [120 W]	1A	
	2	
(c) The parcel first rises and comes to rest momentarily.	1A	
It then falls freely under gravity.	1A	
	2	

Solution	Marks	Remarks
3. (a) By the conservation of momentum,		
$0.03\ v = 0.04 \times 3$		
$v = 4\ \text{m s}^{-1}$	1A	
	1	
(b) By P.E. lost = K.E. gain	1M	
$mgh = \frac{1}{2} mv^2$		
$0.03 \times 9.81 \times h = 0.5 \times 0.03 \times 4^2$		
$h = 0.815$ m [0.8 m]	1A	
	2	
(c) Time of flight = 1.2 / 3 = 0.4 s	1A	
Vertical distance ball Y travelled before hitting the ground,		
$S = \frac{1}{2} at^2$		
$= 0.5 \times 9.81 \times 0.4^2$	1M	
$= 0.7848$ m [0.8 m]	1A	
The height H of the bench is 0.7848 m [0.8 m].		
	3	
(d) The time of flight remains unchanged	1A	
as both the initial vertical speed and the vertical displacement remain unchanged.	1A	
OR : as it is independent of the horizontal speed of the projectile.	1A	
	2	

Solution	Marks	Remarks
4. (a) (i) $\dfrac{GMm}{r^2} = m\omega^2 r$	1M	
$r^3 = \dfrac{GM}{\omega^2}$		
On earth's surface,		
$\dfrac{GMm}{r_E^2} = mg$	1M	
$GM = gr_E^2$		
Hence,		
$r^3 = \dfrac{GM}{\omega^2} = \dfrac{gr_E^2}{\omega^2} = \dfrac{gr_E^2 T^2}{4\pi^2}$		
$r = 4.24 \times 10^7$ m [4.26×10^7 m]	1A	
(ii) By $v = \dfrac{2\pi r}{T}$	1M	
$= \dfrac{2\pi(4.24\times10^7)}{86400}$ = 3080 m s^{-1} [3100 m s^{-1}]	1A	
	5	
(b) (i) 	1A	
(ii) The direction of the required centripetal force is different from the direction of the gravitational force acting on the satellite. / The plane of orbit of a satellite must pass through the centre of the earth. / Accept drawing the correct orbit in great circle.	1A	
	2	

Solution	Marks	Remarks
5. (a) (i) Diffraction	1A	
(ii) $v = f\lambda$		
$= (25)(0.8)$	1M	
$= 20 \text{ cm s}^{-1}$	1A	
(iii) The wavelength of the water wave decreases.	1A	
The degree of diffraction decreases.	1A	
	5	
(b) Path difference at R = 2.0 cm	1M	
= 2.5 λ }		
∴ Destructive interference at R. }	1A	
Amplitude of the water wave at R decreases when another dipper is placed at Q.	1A	
	3	
6. Connect the ray box to the power supply (and switch it on).	1A	
Put the semi-circular glass block onto the protractor. The centre of the semi-circular glass block should coincide with the centre of the paper protractor.	1A	
Direct a light ray into the glass block through the curved side towards its centre.	1A	
Vary the incident angle in the glass block until the refracted ray is parallel to the straight edge of the glass block.	1A	
Read the incident angle from the protractor and the critical angle of the glass block can be obtained.	1A	
(accept using diagrams)	5	

Solution	Marks	Remarks
7. (a) Convex lens.	1A	
Only a convex lens can produce magnified images.	1A	
	2	
(b) (i)(ii) 		
OR: for (ii) 		
Image position and height correct	1A	
Construction ray correct	1M	
Focal length = 17.5 mm	1A	Accept 17 – 18
	3	
(c) An incident ray parallel to the principal axis of the liquid will bend towards the principal axis less after passing through the liquid.	1A	
Thus, the focal length of the liquid drop will increase.	1A	
	2	

Solution	Marks	Remarks
8. (a)		
		
any two forces correct	1A	
all forces correct	1A	
direction of electric field correct	1A	
	3	
(b) (i) $\tan\theta = \dfrac{F}{W}$	1A	
(ii) Electric force $F = qE$ For parallel plates, $E = \dfrac{V}{d}$ }	1A	
From (i), $\tan\theta = \dfrac{F}{W} = \dfrac{qE}{mg} = \dfrac{qV}{mgd}$		
$\therefore q = \dfrac{mgd\tan\theta}{V}$	1A	
$= \dfrac{(0.07\times10^{-3})(9.81)(0.1)\tan 2^\circ}{4000}$		
$= 6.00 \times 10^{-10}$ C [6.11×10^{-10} C]	1A	
	4	
(c) Fix the plates separation and the output voltage of the EHT supply.	1A	
Move the polystyrene tile so that the ball is placed in different positions in the space between the plates.	1A	
OR: Move the point of support of the nylon thread to place the small ball in different positions in the space between the plates.	1A	
Angle θ should remain the same if the electric field between the plates is uniform.	1A	
	3	

Solution	Marks	Remarks
9. (a) (i) $P = \frac{E}{t}$		
$= \frac{(2526-126)}{2\times 60}$	1M	
$= 20$ W	1A	
(ii) $P = VI$		
$20 = 12 \times I$	1M	
$I = 1.67$ A	1A	
(iii) Total current = 1.67×2	1M	
= 3.34 A		
As the total current is less than 5 A, the fuse will not blow.	1A	
	6	
(b) The r.m.s. voltage of the a.c. supply		
$= \frac{15}{\sqrt{2}} = 10.6$ V	1M	
which is smaller than 12 V,		
hence the power output of the heater decreases.	1A	
	2	
10. (a) When the primary current is suddenly interrupted,		
the magnetic field through the secondary coil changes,	1A	
and an e.m.f. is <u>induced</u> across the secondary coil.	1A	
	2	
(b) The number of turns of the secondary coil is much larger than that of the primary coil.	1A	
The rate of change of magnetic flux is very large/the magnetic flux collapses in a very short time.	1A	
	2	
(c) By energy conservation, input power should be equal to the output power,	1A	
$V_pI_p \approx V_sI_s$.		
As the secondary voltage is higher, the primary current is larger.	1A	
In order to minimize the heating effect of the primary current, thick wire should be used as thick wire has smaller resistance.	1A	
	3	

Solution	Marks	Remarks
11. (a) Insert a piece of paper between the sample and the GM tube. The corrected count rate will show no significant change.	1A	
This shows that no α radiation is emitted.		
Insert a piece of 5 mm aluminum plate between the sample and the GM tube.	1A	
The corrected count rate will drop to the background count rate level.	1A	
This shows that β radiation is emitted.		
	3	
(b) $k = \dfrac{\ln 2}{t_{1/2}}$		
$k = \dfrac{\ln 2}{136}$		
$k = 5.10 \times 10^{-3}\ \text{s}^{-1}$	1A	
	1	
(c) Corrected initial count rate = 1000 – 50 = 950 min^{-1}		
Corrected final count rate = 250 – 50 = 200 min^{-1}	1A	
By $C = C_o e^{-kt}$		
$200 = 950\ e^{-(\ln 2/136)\,t}$	1M	
$(\frac{\ln 2}{136})t = \ln\frac{950}{200}$		
$t = 306$ s	1A	
<u>OR</u> : By $C = C_o\left(\dfrac{1}{2}\right)^{\frac{t}{t_{1/2}}}$	1M	
$t = 306$ s	1A	
	3	

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物理 試卷二
PHYSICS PAPER 2

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Solution	Marks	Remarks
Section A : Astronomy and Space Science 1.1 D 1.2 D 1.3 C 1.4 B 1.5 A 1.6 C 1.7 A 1.8 C		
1. (a) (i) $\frac{\Delta\lambda}{\lambda}=\frac{v}{c}$ $v_A = \frac{(656.83-656.28)}{656.28} \times 3\times10^8 = 2.51\times10^5\ \text{m s}^{-1}$	1A	
(ii) The H-alpha line of hydrogen gas at point *B* shows a blue shift, thus hydrogen gas at point *B* is moving towards the Earth.	1A 1A	
(iii) $\frac{mv_r^2}{r}=\frac{GMm}{r^2}$	1M	
$M=\frac{v_r^2 r}{G}=\frac{(2.51\times10^5)^2(10\times10^3\times3.08\times10^{16})}{6.67\times10^{-11}}$ $=2.92\times10^{41}$ kg	1A	Accept 2.91×10^{41}
	5	
(b) (i) By small angle approximation, $\frac{x}{d}=\theta$	1M	
Separation of *CE*, $x = d\theta$ $= 950\times1.6\times\frac{\pi}{180}$ $= 26.5$ kpc	1A	
(ii) The mass of *Y* may have an extended distribution but it is not concentrated at the center.	1A	
	3	
(c) The radiation from a star can be approximated by a black body radiation curve. And the radiation spectrum of a black body is related to its temperature.	1A 1A	
	2	

Solution	Marks	Remarks
Section B : Atomic World		
2.1 A		
2.2 A		
2.3 C		
2.4 B		
2.5 B		
2.6 D		
2.7 B		
2.8 D		
2. (a) (i) According to wave theory, energy of light depends on the intensity.	1A	
No matter what the frequency is, photoelectrons should be emitted when the incident light is intense enough / when the time of exposure is long enough.	1A	
(ii) According to the photoelectric equation, $\frac{1}{2} m_e {v_{max}}^2 = hf - \phi$		
$0 = hf_o - \phi$	1M	
$\phi = h\frac{c}{\lambda_o}$		
$\phi = h\frac{c}{\lambda_o}$		
$= 6.63 \times 10^{-34} \times \frac{3\times10^8}{5.27\times10^{-7}}$	1A	
$= 3.77 \times 10^{-19}$ J		
$\phi = \frac{3.77\times10^{-19}}{1.6\times10^{-19}} = 2.36$ eV	1A	
(iii) It is the minimum energy required to release an electron from a metal surface against the attractive electric force of the metal.	1A	
	6	
(b) (i) Number of photoelectrons $= \frac{I}{e} = \frac{1\times10^{-8}}{1.6\times10^{-19}}$	1M	
$= 6.25 \times 10^{10}$		
Number of photons $= 6.25 \times 10^{10} \div 5\% = 1.25 \times 10^{12}$	1A	
(ii) With a more intense light source of the same type, more photons are emitted.	1A	
Sufficient photons will be scattered by a smaller amount of smoke.	1A	
Hence Peter's claim is correct.		
	4	

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Solution	Marks	Remarks
Section C : Energy and Use of Energy		
3.1 B		
3.2 A		
3.3 C		
3.4 A		
3.5 D		
3.6 B		
3.7 B		
3.8 C		
3. (a) (i) The air in the double-glazed glass has a much lower thermal transmittance than glass / is a poor conductor.	1A	
The double glazed glass is thicker than the single layer window.	1A	
(ii) (1) $\frac{Q}{t} = UA(T_{\text{hot}} - T_{\text{cold}})$		
$= 2.8 \times 2 \times (36 - 24)$		
$= 67.2$ W	1A	
(2) As heat is also transferred through other means, e.g. radiation,	1A	
the actual rate of heat transfer will be higher.	1A	
(iii) Use solar control window film / drawing blinds (accept other reasonable answers)	1A	
	6	
(b) (i) The refrigerant evaporates	1A	
and absorbs the latent heat of vaporization from the room.	1A	
(ii) Heat removed from the room = Pt		
$= 2.54 \times 10^3 \times 5 \times 60$	1M	
$= 7.62 \times 10^5$ J	1A	
	4	

Solution	Marks	Remarks
Section D : Medical Physics		
4.1 B 4.2 C 4.3 A 4.4 D 4.5 C 4.6 D 4.7 D 4.8 A		
4 (a) The lung is filled with air / has a low density.	1A	
	1	
(b) $I = I_0 e^{-\mu x}$ $\frac{I_0}{2} = I_0 e^{-\mu x_{1/2}}$	1M	
$\frac{1}{2} = e^{-\mu x_{1/2}}$ $e^{\mu x_{1/2}} = 2$ $\mu x_{1/2} = \ln 2$	1M	
$x_{1/2} = \frac{\ln 2}{\mu}$		
	2	
(c) By $I = I_0 e^{-\mu x}$ $\frac{1}{8} = e^{-(0.20)x}$	1M	
$x = 10.4$ cm	1A	
OR: Intensity drops to 1/8 after passing through 3 half thicknesses.	1M	
Thickness of lung $= 3 \times \frac{\ln 2}{\mu} = 3 \times \frac{\ln 2}{0.20}$ $= 10.4$ cm	1A	
	2	
(d) Bone has a high linear attenuation coefficient.	1A	
Only very little X-ray can pass through to expose the film. The film appears white after being developed.	1A	
	2	
(e) An artificial contrast medium should be non toxic / have a significantly different linear attenuation coefficient compared to the body tissues / be excretable from the body. (any 2)	2A	
	2	
(f) The patient is exposed to less radiation in X-ray radiographic imaging. X-ray radiographic imaging is fast / cheap / widely available. (any 1)	1A	
	1	