HKDSE MOCK EXAMINATION 2026

Physics

Marking Scheme

Marking Scheme

Paper I Section A

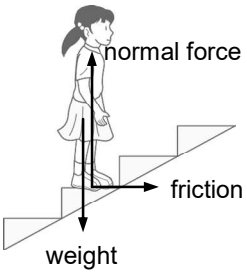
Question No.	Key	Question No.	Key
1.	B	26.	C
2.	C	27.	A
3.	D	28.	B
4.	A	29.	D
5.	B	30.	C
6.	D	31.	B
7.	B	32.	C
8.	D	33.	D
9.	A		
10.	A		
11.	B		
12.	D		
13	A		
14.	B		
15.	A		
16.	B		
17.	A		
18.	A		
19.	D		
20.	D		
21.	D		
22.	C		
23.	A		
24.	A		
25.	D		

Paper I Section B

			Marks
1.	(a)	Put the thermometer into pure melting ice and mark the alcohol level as 0 °C.	1 M
		Put the thermometer into pure boiling water and mark the alcohol level as 100 °C.	1 M
		Divide the length between the two markings into 100 equal divisions. Each division represents 1 °C.	1 M
	(b)	$Pt = mc\Delta T$	
		$(50)(210) = (0.3)\ c\ (73\text{-}25)$	1 M
		$\therefore c = \underline{729\ \text{J kg}^{-1}\ \text{°C}^{-1}}$	1 A
	(c)	Energy is lost to the surroundings. (Or other reasonable answers)	1 M
	(d)	Fully immerse the heating part of the heater into the liquid / Cover the cu p with a lid. (Or other reasonable answers)	1 M
2.	(a)	$\overline{c} = \sqrt{\frac{3RT}{mN_A}} = \sqrt{\frac{3\times 8.31\times(25+273)}{4.81\times10^{-26}\times6.02\times10^{23}}}$	1 M
		$= \underline{507\ \text{m s}^{-1}}$	1 A
	(b)	Gain in internal energy	
		$= \frac{3}{2}nRT_2 - \frac{3}{2}nRT_1$	
		$= \frac{3}{2}\times4\times10^{-3}\times8.31\times\left[(200+273)-(25+273)\right]$	1 M
		$= \underline{8.73\ \text{J}}$	1 A
	(c)	$C = \frac{Q}{\Delta T}$	
		$= \frac{8.73}{200-25}$	1 M
		$= \underline{4.99\times10^{-2}\ \text{J °C}^{-1}}$	1 A
	(d)	Let the final temperature be T °C.	
		Energy gained by the water = energy lost by the air	
		$5\times10^{-3}\times4200\times(T-25) = 4.99\times10^{-2}\times(200-T)$	1 M
		$\therefore T = \underline{25.4\ \text{°C}}$	1 A

Marks

3. (a) (i)



(weight and normal force both correct) 1 A
(friction correct) 1 A

(ii) Consider the vertical direction, taking the upward direction as positive.

By Newton's second law,

$R - mg = ma \sin 40°$

$R - 60 \times 9.8 = 60 \times 0.2 \times \sin 40° = 596$ N 1 M

$\therefore R = \underline{596 \text{ N}}$ 1 A

Consider the horizontal direction, taking the direction to the right as positive.

$f = ma \cos 40° = 60 \times 0.2 \times \cos 40° = \underline{9.19 \text{ N}}$ 1 A

(b) Since the average acceleration is the same, the average net force is also the same. 1 M

Consider the horizontal direction. It can be seen that the average friction is equal to the value in (a)(ii). 1 M

Consider the vertical direction. Since the weight is unchanged, the average normal force is also equal to the corresponding value in (a)(ii). 1 M

4. (a) Consider the vertical motion of the acrobat. Take the upward direction as positive.

Height of the wall $= s_y = u_y t + \frac{1}{2} a_y t^2$

$= 15 \times \sin 80° \times 2 + \frac{1}{2} \times (-9.81) \times 2^2$ 1M

$= 9.92$ m 1A

Consider the horizontal motion of the acrobat.

Distance of the wall from the trampoline $= s_x = u_x t$ 1M

$= 15 \times \cos 80° \times 2$

$= 5.21$ m 1A

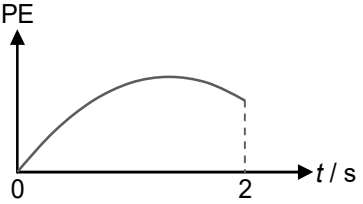
(b) Gain in PE = loss in KE

$= \frac{1}{2} mu^2 - \frac{1}{2} mv^2$ 1M

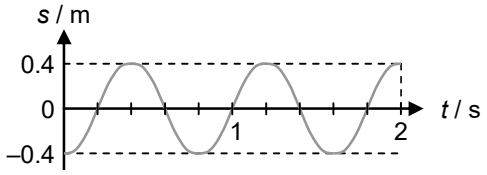
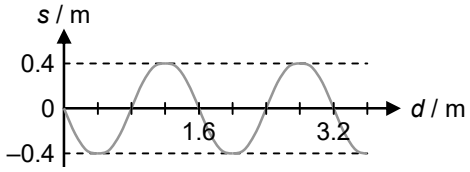
$= \frac{1}{2} \times 85 \times 15^2 - \frac{1}{2} \times 85 \times (15 \times \cos 80°)^2$

$= 9270$ J 1A

(c)

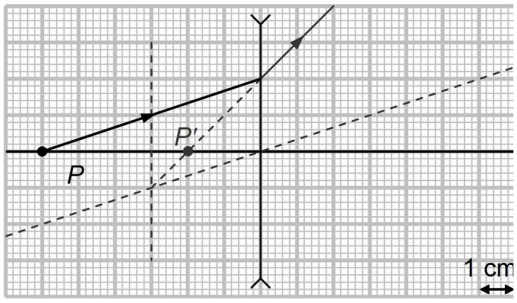


(Correct axes and labels) 1A
(Correct shape of the graph) 1A

				Marks
5.	(a)	(i)	$\lambda = 1.6$ m	1 A
		(ii)	$A = 0.4$ m	1 A
		(iii)	$T = 0.8$ s	1 A
	(b)	(i)		1 A
		(ii)		1 A
6.	(a)		Optical fibres can be used.	1 A
			Sunlight is transmitted through optical fibres by total internal reflection.	1 A
			(Or other reasonable answers)	
	(b)	(i)	It saves the electrical energy for lighting.	1 A
			(Or other reasonable answers)	
		(ii)	In Hong Kong it is difficult to collect enough sunlight for lighting since sunlight is mostly blocked by other tall buildings around /	1 A
			sunlight has to travel a long distance in a tall building to reach the lower floors.	1 A
			(Or other reasonable answers)	
7.	(a)		*X* is the <u>earth wire.</u>	1 A
			If the live wire accidentally touches the metal case of an appliance, the current will flow to the earth through the earth wire instead of the body of a person who touches the appliance.	1 M
			As a result, an <u>electric shock can be avoided</u>.	
	(b)		$I_{charger} = \frac{V}{R} = \frac{220}{4000} = 0.055$ A	1 M
			$I_{heater} = \frac{P}{V} = \frac{1800}{220} = 8.18$ A	1 M
			Current through the fuse = 8.18 + 0.055 = 8.24 A < 13 A	
			Therefore, the fuse <u>will not break</u>.	1 A
8.	(a)		Anticlockwise	1 A
	(b)		$F=NBIl\sin\theta$	
			= (4)(0.2)(10)(0.1)sin(90)	1 M
			= <u>0.8 N</u>	1 A
	(c)	(i)	By $\tau = Fd$,= (0.8)(0.1)	1 M
			= <u>0.08 N m</u>	1 A

Marks

9



(a) (Correct location of P') 1 M

(b) (Correct refracted ray) 1 M

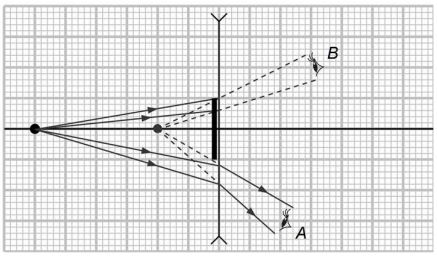
(c) (Draw a line through the optical centre, parallel to the incident ray) 1 M

(Extend refracted ray) 1 M

(Correct focal plane) 1 M

The focal length of the lens is 3 cm. 1 A

(d)



(Light rays from the ball to A are not affected) 1 M

(Light rays from the ball to B are blocked) 1 M

A can see the image. 1 A

B cannot see the image as light rays are blocked by the barrier. 1 A

10 (a) (i) Negative 1 A

(ii) $F_B = BQv\sin\theta = (0.5)(1.6\times10^{-19})(1.2 \times 10^5)\sin(90)$ 1 M

$= \underline{9.6\times10^{-15}\text{ N}}$ 1 A

(iii) As the magnetic force is always perpendicular to the velocity of the particle, 1 A

it does no work on the particle. 1 A

(iv) Magnetic force = centripetal force

$9.6 \times 10^{-15} = \frac{m\times(1.2\times10^5)^2}{0.15}$ 1 M

$m = \underline{1\times10^{-25}}$ kg 1 A

(b) The particles in paths A and B experience the <u>same magnetic force F</u> and have the same speed v. 1 M

According to $F_C = m\frac{v^2}{r}$,the mass m is proportional to radius r, i.e. $m \propto r$ 1 A

Since the radius r of path B is smaller, the particle in <u>path B is lighter</u>. 1 A

(c) No 1 A

				Marks
11	(a)		Isotopes are nuclides of an element with the same atomic number but different mass number.	1 A
	(b)	(i)	Consider the mass numbers: 235 + 1 = 131 + x + 3 × 1	
			$\therefore x$ = 102	1 A
		(ii)	The equation represents a nuclear fission	1 A
			because the U-235 nucleus is split up into lighter nuclei.	1 A
	(c)		I-131 emits β radiation which is ionizing radiation.	1 A
			The radiation can destroy or damage living cells in the thyroid.	1 A
	(d)	(i)	$A = A_0 e^{-kt} \rightarrow ln(\frac{A}{A}) = -kt \rightarrow$	
			Compare to y = mx +c, we get slope of the graph = $-k$	
			$\frac{-0.13-0}{1.5-0} = -k$	1 M
			$\therefore k$ = 0.0867 day^{-1} (= 1.003×10^{-6} s)	1 A
		(ii)	$t_{\frac{1}{2}} = \frac{ln2}{k} = \frac{ln2}{0.0867} = 8\ days$	1 M+1 A
	(e)		By $ln\left(\frac{A}{A}\right) = -kt$	
			$\therefore t = -\frac{1}{k} \times ln(\frac{A}{A_0}) = -\frac{1}{0.0867} \times ln(\frac{100}{4000})$= 42.6 days	1 M
			At least 42.6 days are required	1 A

Paper II

Section A: Astronomy and Space Science

1.	2.	3.	4.	5.	6.	7.	8.
B	C	C	B	C	B	A	A

Marks

1. (a) S rises and sets everyday as seen from the Earth, and so it cannot always be observed. 1 A

(b) The relative motion between the source (i.e. the star) and the observer on the Earth gives rise to the Doppler effect. 1 A

(c) (i) From the plot, the peak values of the graph correspond to the speeds of S when it is moving directly towards or away from the Earth. 1 A

Orbital speed of S

$$v_S = c\left|\frac{\Delta\lambda}{\lambda}\right| = (3\times10^8)\times\left|\frac{0.13\times10^{-12}}{656.3\times10^{-9}}\right| = 59.42 \approx 59.4 \text{ m s}^{-1}$$ 1 M + 1 A

Orbital radius of S

$$R_S = \frac{v_S}{\omega_S} = \frac{v_S T_S}{2\pi} = \frac{59.4\times(60\times60\times100)}{2\pi} = 3.4047\times10^6 \approx 3.40\times10^6 \text{ m}$$ 1 M + 1 A

(d) By Kepler's third law of planetary motion, $T^2 = \frac{GM}{4\pi^2}R^3$

Orbital radius of P

$$R_P = \left(\frac{GM_S T_P^2}{4\pi^2}\right)^{\frac{1}{3}} = \left[\frac{(6.67\times10^{-11})\times(2.10\times10^{30})\times(60\times60\times100)^2}{4\pi^2}\right]^{\frac{1}{3}}$$ 1 M

$= 7.718\times10^9 \approx 7.72\times10^9$ m 1 A

(e) The curve of the graph will shift upwards. 1 A

Section B: Atomic world

1.	2.	3.	4.	5.	6.	7.	8.
B	B	D	A	B	B	C	B

Marks

2. (a) (i) Feature 1: There is a threshold frequency for the incident radiation below which no photoelectron is emitted irrespective of the radiation intensity.
Feature 2: The maximum kinetic energy of the photoelectrons depends only on the frequency and not the intensity of the incident radiation.
Feature 3: No time delay occurs during the emission of photoelectrons.
(Any Two of above / other reasonable answers) 1 M + 1 M

(ii) Explanation 1: The energy carried by a photon is hf and so the electrons cannot acquire enough energy to escape from the metal surface.
Explanation 2: By Einstein's photoelectric equation K.E.max = hf $-$ ϕ, the maximum kinetic energy depends only on the frequency of the incident photons.
Explanation 3: The incident photons transfer energy to an electron once it is absorbed.
(Any Two of above / other reasonable answers) 1 M + 1 M

(b) (i) Work function is the minimum amount of energy required to remove an electron from a metal surface. 1 A

(ii) Threshold frequency of the alloy : $f_0 = \frac{\phi}{h} = \frac{(1.8)(1.60\times10^{-19})}{6.63\times10^{-34}} = 4.34\times10^{14}\,\text{Hz}$ 1 M

Frequency of the infrared radiation : $f = \frac{c}{\lambda} = \frac{3\times10^{8}}{1000\times10^{-9}} = 3\times10^{14}\,\text{Hz} < f_0$ 1 M

Hence the photomultiplier tube does not work with the infrared radiation. 1 A

Alternative:
Energy of the infrared photon:
$$E = hf = \frac{hc}{\lambda} = \left[\frac{\left(6.63\times10^{-34}\right)\left(3\times10^{8}\right)}{1000\times10^{-9}}\right]\frac{1}{1.60\times10^{-19}} \approx 1.24\,\text{eV} < 1.8\,\text{eV}$$
Hence the photomultiplier tube does not work with the infrared radiation.

(iii) The more intense is the incident light, the more photons reach the photocathode. 1 A
Since each photoelectron has to absorb one photoelectron before it is emitted, more photos reaching the photocathode results in more electrons to be emitted. 1 A
So, Derek's claim is correct.

Section C: Energy and Use of energy

1.	2.	3.	4.	5.	6.	7.	8.
A	B	C	B	B	C	C	A

Marks

3. (a) Solar panels are portable, so they can be easily transported to remote areas.(Or other reasonable answers) 1 A

(b) Maximum energy stored = $Pt = 7 \times 60 \times 60 \times 24 \times 3$ 1 M

$= \underline{1.81 \times 10^6 \text{ J}}$ 1 A

(c) $1000 \times A \times 18\% = 45$ 1 M

$A = \underline{0.25 \text{ m}^2}$ 1 A

(d) There is an extended period of rainy (or cloudy) weather. 1 A

(e) (i) By $P_{\text{最大}} = \frac{1}{2}\rho A v^3 = \frac{1}{2} \times 1.2 \times (\pi \times 0.8^2) \times \left(\frac{20 \times 10^3}{3600}\right)^3$ 1 M

$= \underline{207 \text{ W}}$ 1 A

(ii) Air does not stop after passing through the turbine. 1 A

The generator in the turbine is not 100% efficient. 1 A

(Or other reasonable answers)

Section D: Medical Physics

1.	2.	3.	4.	5.	6.	7.	8.
A	A	A	D	B	A	A	D

Marks

4. (a) The result does not tell which kidney is not working normally. 1 A

(b) (i) Only a few radionuclides are accumulated in the kidneys. 1 A

(ii) More radionuclides are accumulated in the kidneys. 1 A

The kidney appearing whiter absorbs fewer radionuclides. 1 A

(iii) Most radionuclides have decayed / been removed from the body by biological processes. 1 A

(c) (i) By $\frac{1}{t_{eff}} = \frac{1}{t_{phy}} + \frac{1}{t_{bio}}$,

$$t_{eff} = \left(\frac{1}{t_{phy}} + \frac{1}{t_{bio}} \right)^{-1} = \left(\frac{1}{6} + \frac{1}{4} \right)^{-1} = \underline{\underline{2.4 \text{ hours}}}$$ 1 M

Decay constant $k = \frac{\ln 2}{t_e} = \frac{\ln 2}{2.4} = 0.289 \text{ h}^{-1}$

By $A = A_0 \, e^{-kt}$, 1 M

$$t = \frac{-1}{k} \ln \frac{A}{A_0} = \frac{-1}{0.289} \ln 0.1 = \underline{\underline{7.97 \text{ h}}}$$ 1 A

<u>Or</u> By $A = A_0 \left(\frac{1}{2} \right)^{\frac{t}{t_e}}$, 1 M

$$t = t_e \frac{\ln \frac{A}{A_0}}{\ln 0.5} = 2.4 \times \frac{\ln 0.1}{\ln 0.5} = 7.97 \text{ h}$$ 1 A

(ii) Any two of the following: 1 A + 1 A

-Emit γ radiation only

-Non-toxic / no pharmacological effect

-Decay to a stable nuclide

(Accept other reasonable answers.)