# Po Leung Kuk Tang Yuk Tien College 2018 - 2019

## F.6 MOCK EXAMINATION PHYSICS PAPER 2

## Marking Scheme

**SECTION A: Astronomy and Space Science (20 marks, 10% of subject mark)**

**Multiple-choice questions**

| 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 |
|---|---|---|---|---|---|---|---|
| B | B | D | A | C | C | C | A |

**Structured question**

**1** (a) (i) *D*

(ii) As Parker slows down, the centripetal force required will decrease. **(1A)**

So, the gravitational force given by the Sun will now be larger than the centripetal force required, and thus moves Parker inwards. **(1A)**

(b) By Kepler's third law,

$(T_2/T_1)^2 = (a_2/a_1)^3$

$(T/365)^2 = (0.388/1)^3$ **(1M)**

$T = 365 \times 0.388^{3/2} = 88.2$ days **(1A)**

(c) (i) $\theta \approx D/d = (2 \times 0.7)/6.9$ **(1M)**

$= 0.2029$ rad $= 0.2029 \times 180°/\pi = 11.6°$ **(1A)**

(ii) $L = 4\pi R^2 \cdot \sigma T^4 = 4\pi(0.7 \times 10^9)^2(5.67 \times 10^{-8})(5770)^4 = 3.870 \times 10^{26}$ W **(1M)**

$I = L/(4\pi d^2) = (3.870 \times 10^{26})/(4\pi \times (6.9 \times 10^9)^2)$ **(1M)**

$= 647\,000$ W m$^{-2}$ **(1A)**

**SECTION B: Atomic World (20 marks, 10% of subject mark)**

**Multiple-choice questions**

| 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | 2.7 | 2.8 |
|---|---|---|---|---|---|---|---|
| B | C | A | C | D | C | A | B |

**Structured question**

**2.** (a) To produce a narrow parallel beam (1A)

(b) A continuous spectrum would be obtained. (1A)

Because in the Rutherford's model the electrons can move into an orbit of any radius, the photon emitted can carry energy of any value and hence any wavelength. (1A)

(c) (i) The grating separation

$$d = \frac{0.001}{500} = 2 \times 10^{-6}\ \text{m}$$

The first bright fringe ($m = 1$) is located at 14.2°. Applying $d \sin\theta = m\lambda$,

$$\lambda = \frac{d \sin\theta}{m}$$

$$= \frac{(2 \times 10^{-6})(\sin 14.1°)}{1} \quad \text{(1M)}$$

$$= 4.87 \times 10^{-7}\ \text{m} \quad \text{(1A)}$$ (1M+1A)

(ii) Energy

$$E = \frac{hc}{\lambda} \quad \text{(1M)}$$

$$= \frac{1243\ \text{eV nm}}{487\ \text{nm}} = 2.55\ \text{eV} \quad \text{(1A)}$$ (1M+1A)

(iii) Energy

$$E = 0 - \left(-\frac{13.6\ \text{eV}}{n^2}\right) = \frac{13.6\ \text{eV}}{n^2}$$

$E(n{=}1) = -13.6$ eV

$E(n{=}2) = -3.4$ eV

$E(n{=}3) = -1.51$ eV

$E(n{=}4) = -0.85$ eV

The transition is $n$=4 to 2. (1M+2A)