

Name of the Student: _____

Max. Marks : 26 Marks

Time : 26 Minutes

Mark Schemes

Q1.

- (a) lowest energy state/level that the electron can occupy
or state in which electron needs most energy to be released
B1
or the level of an unexcited electron (not lowest orbit)
1
- (b) (i) force = mv^2/r or mrv^2 and $v = r\omega$
B1
 $8.1 \times 10^{-8} = 9.1 \times 10^{-31} \times v^2 / 5.3 \times 10^{-11}$
or ($v^2 =$) 4.72×10^{12} seen
B1
 2.17×10^6 (m s⁻¹)
B1
- (ii) $\lambda = h/mv$ or $6.6 \times 10^{-34} / 9.1 \times 10^{-31} \times 2.2 \times 10^6$
C1
 3.3×10^{-10} m
A1
- (iii) circumference = $2\pi 5.3 \times 10^{-11} = 3.3 \times 10^{-10}$ m
M1
1 (allow e.c.f. from (ii))
A1
- (c) (i) $1.9(4) \times 10^{-18}$ J
B1
- (ii) 5.6×10^{-19} J (e.c.f. 2.5×10^{-18} – their (i))

7

- (iii) energy difference $E = 3 \times 10^{-19} \text{ J}$
(condone any difference)

B1

C1

$$E = hc/\lambda \text{ or } E = hf \text{ and } c=f\lambda$$

$$\text{or their } E = 6.6 \times 10^{-34} \times 3.0 \times 10^8/\lambda$$

C1

$$6.6 \text{ or } 6.7 \times 10^{-7} \text{ m}$$

A1

5

[13]

Q2.

(a) (i) $\Delta E = mg\Delta h$

B1

$$= (16.8+1.2)9.8 \times 0.5 \text{ or a mass} \times 9.8 \times 0.5$$

B1

$$= \mathbf{88.2} \text{ (J)}$$

B1

3

(ii) 108 J or answer to (a) (i) + 20 J

B1

1

(iii) 108/0.40 allow ecf from (ii) (i.e. their (ii)/0.40)

C1

$$270 \text{ N } \{68/.4 = 170\}$$

A1

2

(b) gain in KE = loss in PE - work done

C1

$$= 88-20 = 68$$

C1

$$\text{KE} = \frac{1}{2} mv^2$$

C1

$$v = 2.7(5) \text{ m s}^{-1} \text{ no ecf}$$

(c)



graph starts at origin and forms a full rounded peak

B1

exactly two cycles (4 peaks) shown but not arches

B1

height of peaks decreases **and** peaks approximately equally spaced

B1

3

[13]