

Name of the Student: _____

Max. Marks : 22 Marks

Time : 22 Minutes

Mark Schemes

Q1.

- (a) (i) nucleon number is the number of protons and neutrons OR mass number
proton number is the number of protons OR atomic number ✓ 1
- (ii) $14 - 6 = 8$ ✓ 1
- (iii) specific charge = $6 \times 1.6 \times 10^{-19} \checkmark / (14 \times 1.66 \times 10^{-27} \checkmark)$
specific charge = $4.1 \times 10^7 \text{ (C kg}^{-1}\text{)} \checkmark$ 3
- (b) (i) isotopes are variations of an element that have same
proton/atomic number ✓
but different nucleon number OR different number of neutrons ✓ 2
- (ii) $4.8 \times 10^7 = 6 \times 1.6 \times 10^{-19} \checkmark / (A \times 1.66 \times 10^{-27})$
 $A = 6 \times 1.6 \times 10^{-19} / (4.8 \times 10^7 \times 1.66 \times 10^{-27})$
 $A = 12 \checkmark$
Number of neutrons = $12 - 6 \checkmark$ 3

[10]**Q2.**

- (a) (i) minimum energy required ✓
to remove electron from metal (surface) OR cadmium OR the material ✓ 2
- (ii) photons have energy dependent on frequency OR energy of photons constant ✓
one to one interaction between photon and electron ✓
Max KE = photon energy – work function in words or symbols ✓
more energy required to remove deeper electrons ✓ 4

(iii) (use of $hf = \phi + E_{k(max)}$)

$$6.63 \times 10^{-34} \times f = 4.07 \times 1.60 \times 10^{-19} \checkmark + 3.51 \times 10^{-20} \checkmark$$

$$f = 1.04 \times 10^{15} \text{ (Hz) OR } 1.03 \times 10^{15} \text{ (Hz) } \checkmark \checkmark \text{ (3 sig figs)}$$

4

- (b) theory makes predictions tested $\checkmark$ by repeatable/checked by other scientists/peer reviewed (experiments) OR new evidence that is repeatable/checked by other scientists/peer reviewed $\checkmark$

2

[12]