Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Mark Schemes

Q1.

(a)

	$^{223}_{88}Ra$	$^{224}_{88}Ra$	$^{225}_{88}Ra$	$^{226}_{88}Ra$
Isotope with smallest mass number	(✓)			
Isotope with most neutrons in nucleus				✓
Isotope with nucleus that has highest specific charge	✓			
Isotope that decays by β^- decay to form $^{225}_{89}Ac$			✓	
Isotope that decays by alpha decay to form $^{220}_{86}Rn$		✓		

one mark for each correct row (ignore first row as already ticked)
allow cross instead of tick and ignore any crossed out ticks
if more than one tick in a row then no mark

4

(b) (i) the atom has lost <u>two electrons</u>✓

1

(ii) (*use of specific charge = charge ÷ mass*)
mass = $3.2 \times 10^{-19} \div 8.57 \times 10^{5} = 3.734 \times 10^{-25}$ (kg)
mass number = $3.734 \times 10^{-25} \div 1.66 \times 10^{-27}$ ✓(= 225)
hence $^{225}_{(88)}Ra$ OR 225✓✓
OR
calculate specific charge for each isotope✓
hence $^{225}_{(88)}Ra$ OR 225✓✓

ignore any reference to electrons
first mark for deduction
bald correct answer scores 2 marks

don't need radium symbol or 88
wrong answer scores zero

3

[8]

Q2.

(a) (i) X must have a negative charge✓
to conserve charge✓

second mark dependent on first i.e. conserve charge alone scores nothing
can gain second mark by showing balanced equation

2

(ii) X must be a baryon✓
to conserve baryon number✓

here two marks are independent i.e. conserve baryon number alone scores 1 mark
can gain second mark by showing balanced equation

2

(iii) K^-: s $\bar{u}$ OR strange anti-up ✓
K^+: u $\bar{s}$ OR up anti-strange✓
K^0: d $\bar{s}$ OR s $\bar{d}$ OR down anti-strange OR strange anti–down✓

in each case the symbols or words can be in either order
must be a bar over anti – quark
can be upper case letters e.g. U

3

(iv) (strangeness on LHS is -1)
strangeness on RHS without X is +2 / strangeness of X is -3 ✓
thus sss
OR
strangeness on RHS without X is +2 / strangeness of X is -1✓
thus sdd✓✓

correct strangeness without X on RHS is minimum working needed for first mark
next two marks awarded for correct quark structure

3

[10]