Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Particle And Radiation

Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

(a) Photon

(right-hand box) TO for listing
Must state name

Weak (nuclear) / weak interaction / weak nuclear interaction / weak force

B1

(left-hand box) TO for listing

2

(b) Charge / (electric) charge

B1

TO for listing any other physical quantity
Must be word; do not accept symbol

1

(c) Higgs (boson) / Higgs (particle) / Higgs (boson particle)

Not graviton

Accept Higg / Higs / Hig

B1

TO for listing

1

[4]

Q2.

(a) Calcium = 40, 20 correct order

B1

Beta minus = 0, −1 correct order

B1

MAX 2

Top line correct / bottom line correct

B1

2

(b) Same energy released in (each) decay

B1

When beta less than max there is missing energy / missing energy cannot be accounted for by recoil of (daughter) nucleus / total energy of beta and recoil nucleus not constant (appears to be violation of conservation of energy)

B1

If only two particles there wouldn't be a range there would be a single value

(Must be another particle) to carry away (missing) energy

B1

3

[5]

Q3.

(a) Minimum energy to remove an electron

B1

from a (metal) surface

B1

2

(b) Converts 2.28 (e V) to 3.6×10^{-19} (J) / $2.28 \times 1.6 \times 10^{-19}$

C1

Condone minus sign here on energy or charge

Use of $hf = \phi_0$

e.g. $f = 2.28 / h$ (will need to see subject)

or $2.28 = 6.6(3) \times 10^{-34} \times f$ or $f =$

$2.28 / 6.6(3) \times 10^{-34}$ (will need to see subject)

Makes f subject or substitutes correctly for h and ϕ_0

C1

allow equivalent substitution into $hf = \phi_0 + KE_{max}$ where $KE = 0$

Penalise minus sign on answer

(f =) $5.5(0) \times 10^{14}$ (Hz) cao

A1

3

[5]

Q4.

(a) (i) Hadrons / hadron

B1

TO listing

1

(ii) d = −1/3 (e) anti s = +1/3 (e) **and** −1/3 (e) + 1/3(e) = 0

must see summing and equal to zero, in either order when d and anti s are identified

B1

When d and anti s are not identified then need to see:
−1/3 (e) + 1/3(e) = 0 in this order

1

(b) (i) (+)1 or +1/3+1/3+1/3

B1

−1

B1

2

(ii) strangeness violation allowed in (weak) decay / conserve baryon number / conserve lepton number / conserve charge / must have a baryon number of zero / must have a lepton number of zero / fully describes charge conservation e.g. 0 = −1(e) + 1(e) or in words

B1

TO where incorrect listing

1

(iii) Contains strange quark / has strangeness / doesn't decay by strong interaction because strangeness not conserved in decay

B1

Contains anti-strange quark

1

[6]