Question 1

a.) velocity, displacement, momentum, weight (any 2) --- [B2]

b.) Average value of scale A is 66 kg. Average value for scale B is 78.5 kg. --- [B1]
Thus, scale A more accurate than scale B. (Scale A has a closer value to actual value) --- [B1]

Scale A can measure up to 1 kg. Scale B can measure up to 0.1 kg. --- [B1]
Thus, scale B is more precise than scale A. --- [B1]

iii.) average reading on scale B – 78.85 kg --- [M1]

% uncertainty = (0.1 / 78.5) * 100% = 0.13 % --- [A1]

Question 2

a.) i.) $F = ma = 1.9 \text{ X } 10^5 / 5.6 \text{ X } 0^4$ --- [C1]
$a = 3.39$ or 3.4 ms^{-2} --- [A1]
ii.) $v^2 = u^2 + 2as$, $S = 82^2 / 2 \text{ x } 3.4$ --- [C1]
$s = 989$ or 992 m --- [A1]

b.) As speed increases, air resistance also increase. So, the net force will not be constant. --- [B1]
Hence runway is required to be longer. --- [B1]

Question 3

a.) Arrow R touching the ground and upwards --- [B1]

b.) F (1.5) = (500) (0.7) --- [B1]
F = 233 N --- [A1]

c.) Net upward force = net downward force --- [B1]
R = 500 – 233 = 267 N --- [A1]

Question 4

a.) p = mv – mu
p = 0 - (18)(7.2) --- [C1]
p = 129.6 $kgms^{-1}$ or 130 $kgms^{-1}$ (negative sign acceptable) --- [A1]

ii.) F = (129.6 / 1) --- [C1]
= 129.6 N or 130 N (negative sign acceptable) --- [A1]

b.) water rebounds, - greater change in momentum --- [B1]
Thus greater magnitude of force --- [B1]

Question 5

a.) Crystalline – particles show regular arrangement. / structure repeats itself --- [B1]
(metal, copper, diamond) --- [B1]
Non crystalline – particles are not arranged in order --- [B1]
(glass, wax, ceramics) --- [B1]

b.) Stress – force acting normally perunit cross sectional area --- [B1]
Strain – ratio of its extension to the original length --- [B1]

c.) i.) m = pV --- [C1]
m = 3.8 x 10^{-3} kg --- [A1]
ii.) ε = e / l = 8 x 10^{-3} / 2 --- [C1]
ε = 4.0 x 10^{-3} --- [A1]
iii.) 1.) work done, W = ½ Fx = ½ (48)(8 x 10^{-3}) --- [C1] = 0.192 J --- [A1]
2.) work done, W = Fx = (88 x 10^{-3} - 8 x 10^{-3})(48) --- [C1] = 3.84 J --- [A1]

iv.) Some energy is stored as elastic potential energy --- [B1]
while some is lost as heat / thermal energy --- [B1]

Question 6

a.) i.) Spreading of waves – [B1]
when passed through a gap / aperture/opening/obstacles/slits/edge/hole --- [B1]
ii.) Fig 6.1 – more diffraction --- [B1] (approximately equally spaced wavefront) --- [B1]
Fig 6.2 – less diffraction --- [B1] (approximately equally spaced wavefront)

b.) angle = 10.2°
$d\sin\theta = n\lambda$, $\lambda = (1/3 \times 10^{5}) (\sin \theta)$ --- [C1]
λ = 591 or 5.91 x 10^{-7} m --- [A1]

Question 7

a.) (20 – 12) --- [C1] = (2)(0.15 + R) --- [C1]
R = 3.85 Ω --- [A1]

b.) P = VI = (20)(2) --- [C1]
= 40 W --- [A1]

c.) $P = I^2R = (2)^2(0.05 + 0.10+3.85)$ --- [C1]
= 16 W --- [A1]

d.) P = VI = (12)(2) --- [C1]
= 24 W --- [A1]

Question 8

Primarily alpha particles – helium nucleus (nuclide symbol given) or positive charged or high ionizing power --- [B1]
Beta particles – (nuclide symbol given) or negatively charged --- [B1]
Gamma rays – electromagnetic radiation. (no charged/ neutral) --- [B1]
(*Or any other relevant points / characteristics)