Q1. What are the numbers of hadrons, baryons and mesons in an atom of $^{7}_{3}\text{Li}$?

	hadrons	baryons	mesons	
A	7	3	3	○
B	7	4	4	○
C	7	7	0	○
D	10	7	0	○

(Total 1 mark)

Q2. Electron capture can be represented by the following equation.

$$p + e^- \rightarrow X + Y$$
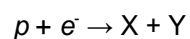
Which row correctly identifies **X** and **Y**?

|	X	Y	
A	p	K^-	○
B	e^-	e^+	○
C	n	V_e	○
D	n	π^0	○

(Total 1 mark)

Q3.   Electrons and protons in two beams are travelling at the same speed. The beams are diffracted by objects of the same size.

Which correctly compares the de Broglie wavelength λ_e of the electrons with the de Broglie wavelength λ_p of the protons and the width of the diffraction patterns that are produced by these beams?

	comparison of de Broglie wavelength	diffraction pattern	
A	$\lambda_e > \lambda_p$	electron beam width > proton beam width	⬭
B	$\lambda_e < \lambda_p$	electron beam width > proton beam width	⬭
C	$\lambda_e > \lambda_p$	electron beam width < proton beam width	⬭
D	$\lambda_e < \lambda_p$	electron beam width < proton beam width	⬭

(Total 1 mark)

Q4. The diagram shows the path of an α particle deflected by the nucleus of an atom. Point P on the path is the point of closest approach of the α particle to the nucleus.
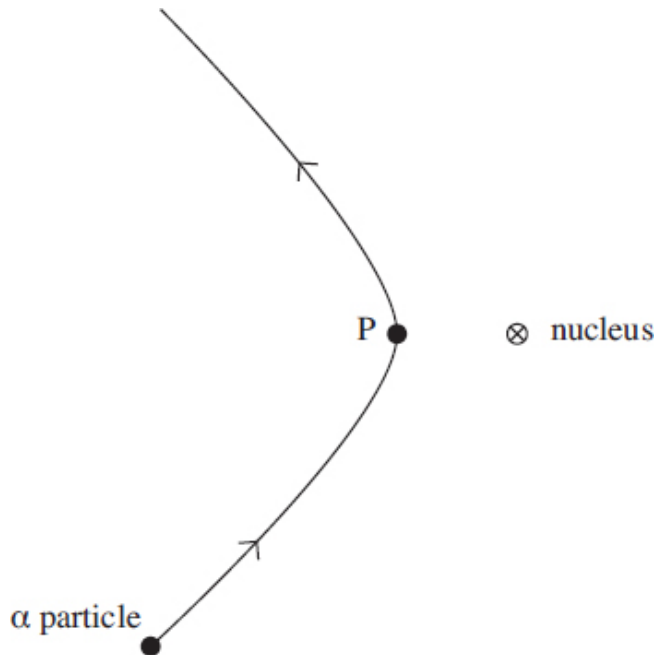
Which one of the following statements about the α particle on this path is correct?

A Its acceleration is zero at P.

B Its kinetic energy is greatest at P.

C Its speed is least at P.

D Its potential energy is least at P.

(Total 1 mark)

Q5. A radioactive nucleus emits a β⁻. particle then an α particle and finally another β⁻. particle. The final nuclide is

A an isotope of the original element

B the same element with a different proton number

C a new element of higher proton number

D a new element of lower nucleon number

(Total 1 mark)

Q6. In a nuclear reaction $^{14}_{7}N$ is bombarded by neutrons. This results in the capture of one neutron and the emission of one proton by one nucleus of $^{14}_{7}N$. The resulting nucleus is

A $^{13}_{7}N$

B $^{14}_{6}C$

C $^{12}_{6}C$

D $^{14}_{8}O$

(Total 1 mark)

Q7. A calcium ion is formed by removing two electrons from an atom of $^{40}_{20}Ca$. What is the specific charge of the calcium ion?

A 3.2×10^{-19} C kg^{-1}

B 2.9×10^{-18} C kg^{-1}

C 4.8×10^{6} C kg^{-1}

D 4.8×10^{7} C kg^{-1}

(Total 1 mark)

Q8. Which of the following is **not** true?

A   Each meson consists of a single quark and a single antiquark.

B   Each baryon consists of three quarks.

C   The magnitude of the charge on every quark is $\dfrac{1}{3}$

D   A particle consisting of a single quark has not been observed.

(Total 1 mark)

Q9. The nucleus of $^{9}_{4}\text{Be}$ captures a proton and emits an α particle. What is the product nucleus?

A $^{10}_{6}\text{C}$ ☐

B $^{7}_{3}\text{Li}$ ☐

C $^{6}_{3}\text{Li}$ ☐

D $^{6}_{2}\text{He}$ ☐
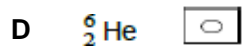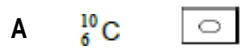
(Total 1 mark)

Q10. An electron collides with a neutral atom and ionizes it. Which of the following describes the particles present after the collision?

A   An electron and an excited atom.   ☐

B   An excited atom containing an excess electron.   ☐

C   Two electrons and a positive ion.   ☐

D   Two electrons and a neutral atom in the ground state.   ☐

(Total 1 mark)

M1. C

[1]

M2. C

[1]

M3. A

[1]

M4. C

[1]

M5. A

[1]

M6. B

[1]

M7. C

[1]

M8. C

[1]

M9. C

[1]

M10. C

[1]