Practice Question Set For GCSE
Subject : Physics
Paper-1 Topic: Atomic Structure (High Demand)

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

Q1.

Lanthanum-140 is a radioactive isotope.

(a) A nucleus of lanthanum-140 emits gamma radiation.

What happens to the mass number and the charge of the nucleus when gamma radiation is emitted?

Tick (✓) **one** box.

Mass number	**Charge**	
Decreases	Decreases	☐
Decreases	Stays the same	☐
Stays the same	Decreases	☐
Stays the same	Stays the same	☐

(1)

(b) Why is it difficult to detect gamma radiation?

_____

_____

(1)

(c) Activity is the rate at which a radioactive source decays.

A teacher measured the count-rate from a sample of lanthanum-140 using a Geiger-Muller (G-M) tube.

Explain why the count rate was less than the activity of the sample of lanthanum-140

_____

_____

_____

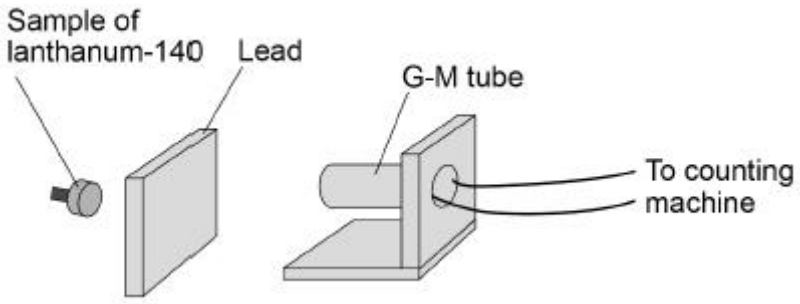
_____

(2)

The teacher investigated how the thickness of lead affected the amount of gamma radiation that could pass through it.

Figure 1 shows the apparatus.

Figure 1



(d) Explain why the teacher stood as far away from the apparatus as possible.

_____

_____

_____

_____

(2)

The table shows the results.

Thickness of lead in cm	Count rate in counts per second
0.5	110
1.0	60
1.5	33
2.0	18
2.5	10

(e) The teacher concluded that the count rate was **not** inversely proportional to the thickness of lead.

Explain why the teacher was correct.

Use the data in the table above.

_____

_____

_____

_____

_____

(3)

(f) Lanthanum-140 can also emit beta radiation and change into cerium.

Complete the equation showing the decay of lanthanum (La) 140 into cerium (Ce).

$$^{140}_{57}La \longrightarrow {}^{\ \ }_{\ \ }e + {}^{\ \ }_{\ \ }Ce$$

(2)

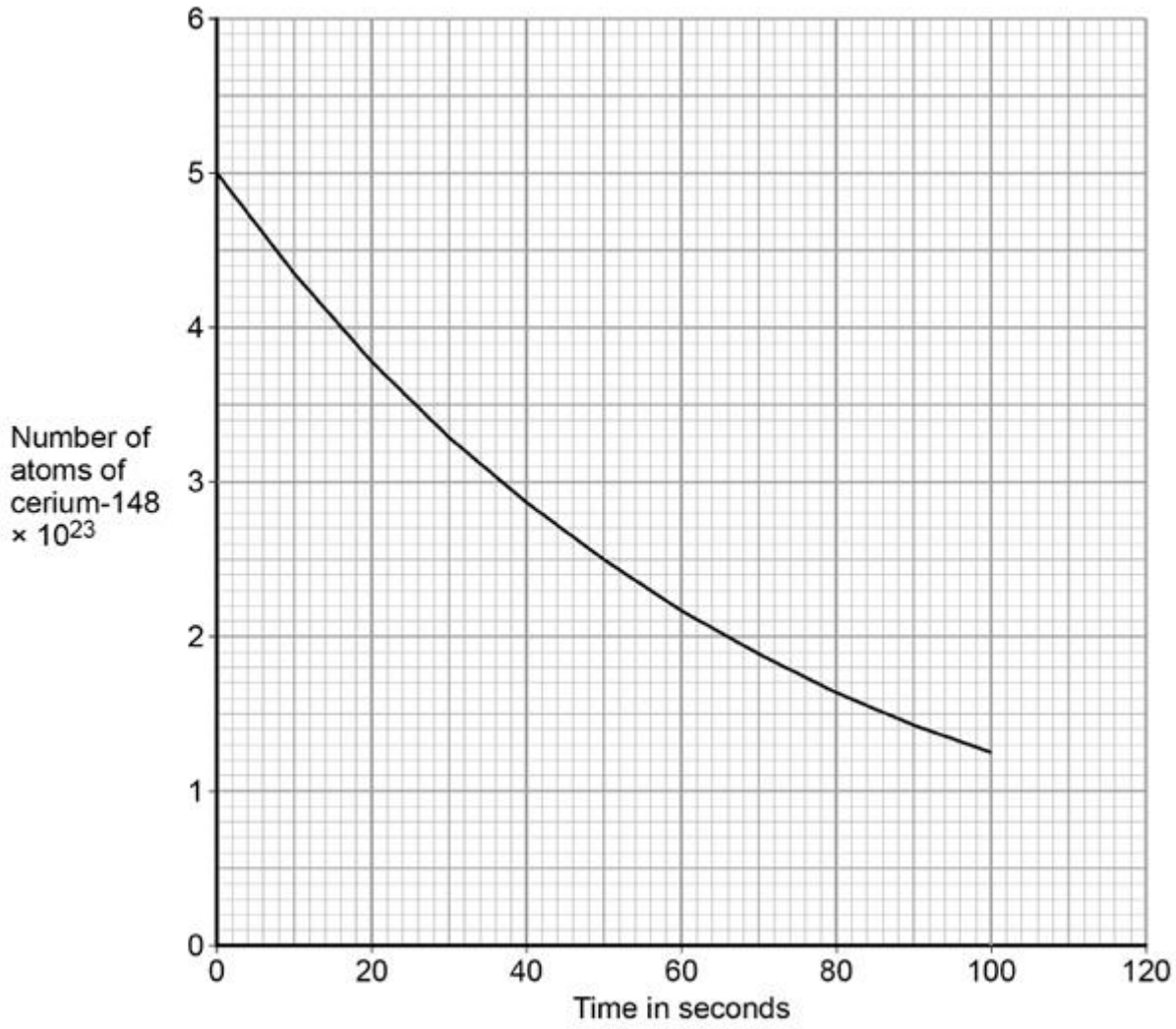
There are other isotopes of cerium which are radioactive.

Different isotopes of cerium have different half-lives.

The half-life of an isotope can be found by studying how the number of atoms changes over time.

Figure 2 shows how the number of atoms of cerium-148 in a 120 g sample changes over time.

Figure 2



(g) Determine the ratio of the number of cerium atoms in the sample when it was 100 seconds old compared with when the sample was 350 seconds old.

Use data from **Figure 2**.

Ratio = _____

(4)

(h) Determine the activity of the sample of cerium when the sample was 20 seconds old.

Use **Figure 2**.

Activity = _____ Bq

(3)

(Total 18 marks)