**6.3 HONORS CLASS WORKSHEET – HALF-LIVES AND USES OF RADIATION**

1. **Calculating and using half-lives**

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| (a) | Magnesium-28 is radioactive. A sample of magnesium-28 was monitored over several days and its rate of decay is shown in the graph below: | | |
| (i) | What type of radiation is magnesium-28 likely to emit? Give a reason for your answer and complete the nuclear equation for the decay of magnesium-28. | |
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| (ii) | Use the graph above to note the time taken for: | |
|  | Time |
| 50% of the sample to decay |  |
| 75% of the sample to decay |  |
| 87.5% of the sample to decay |  |
| (iii) | Hence estimate the half-life of magnesium-28 | |
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| (b) | (i) | Uranium-238 has a half-life of 160,000 years.  Ife has 2000 atoms of uranium-238. | |
| (α) | How many uranium-238 atoms will she have after 480,000 years? |
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| (β) | How many uranium-238 atoms will she have after 100,000 years? |
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| (ii) | Harry has some radium-224. It is radioactive.  He notices that after 14.5 days his sample is emitting radiation at 6.25% of its original rate.  What is the half-life of radium-224? | |
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| (iii) | JaNiece has 500 atoms of iodine-131. It is radioactive.  She notices that after 1 day, she only has 459 atoms remaining.  What is the half-life of iodine-131? | |
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1. **Uses of radiation**

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| (a) | An engineer needs to locate a blockage in an underground pipe. | |
| (i) | Describe briefly how she would use a radioactive material to do this. |
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| (ii) | State and explain what type of radiation the material should emit. |
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| (ii) | State and explain whether the material should have a long or a short half-life. |
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| (b) | Smoke alarms monitor the progress of radiation across 5 mm of air. If the air is smoky the radiation cannot pass through it and this triggers the smoke alarm. | |
| (i) | State and explain what type of radiation the material should emit. |
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| (ii) | State and explain whether the material should have a long or a short half-life. |
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