NAME: .....

X-RAYS

1. a) Explain why an x-ray tube is evacuated. (1mk)

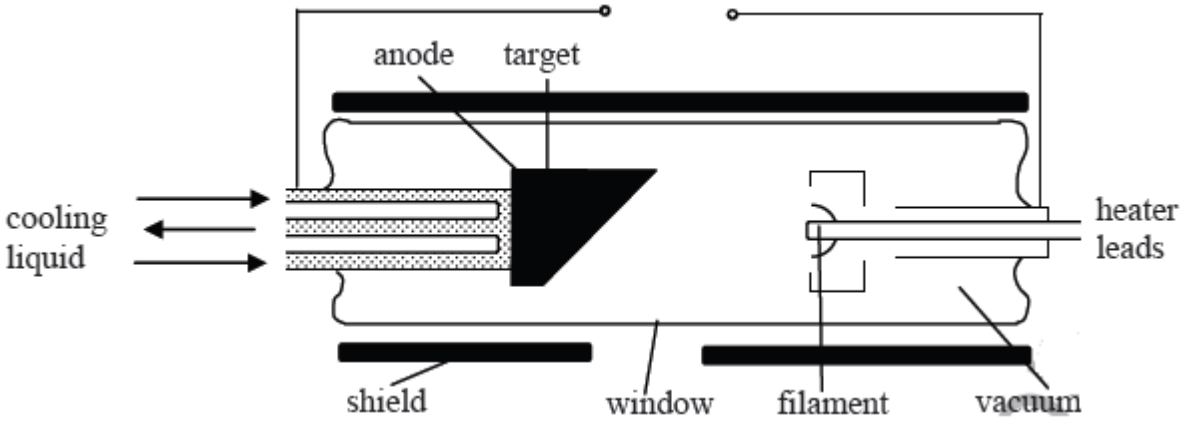
(b) Distinguish between 'hard and soft' x - rays. (3mk)

(4mk)

2. An X -ray machine is almost entirely surrounded by a metal shield. Name this metal and explain why this metal must surround it. Also, explain why the person who operates the machine must wear a similar metal shield.

[3]

3. The diagram shows a picture of a machine that produces X-rays. There is a high potential difference between the target and the filament. The target is connected to the positive side and is called the anode.



(a) On the diagram draw three straight lines (representing X-rays) to show the direction of travel of the X-rays. [2]

(b) State the name given to the filament when it is connected to the negative side of the potential difference.

[1]

(c) State an approximate value for the potential difference across the X-ray tube.

[1]

(d)Describe what happens when the filament is heated in the X-ray tube.

[2]

(e) Explain why a cooling system is needed near the anode.

[2]

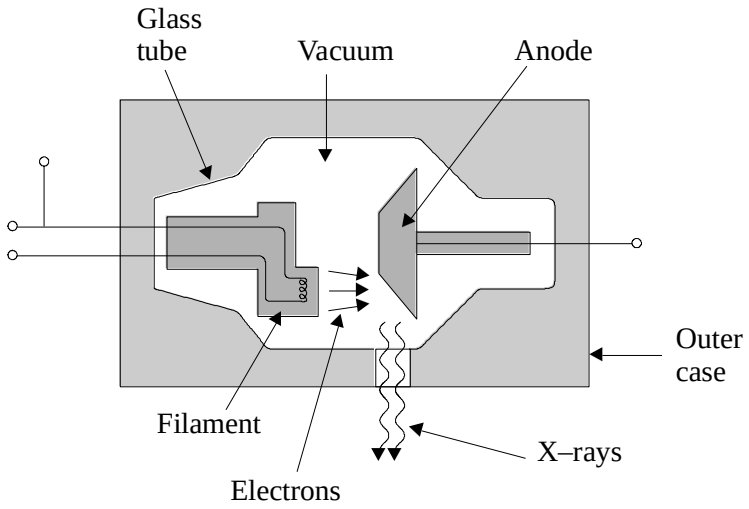
(f) Explain what would happen if there was a gas inside the tube instead of a vacuum.

[2]

(g) The machine is almost entirely surrounded by a metal shield. Name this metal and explain why this metal must surround it. Also, explain why the person who operates the machine must wear a similar metal shield.

[3]
TOTAL / 13

4. The diagram shows part of a diagnostic X-ray tube.



Suggest an appropriate operating voltage for this tube.

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(1)

Why is the anode rotated?

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(1)

Why is the X-ray tube evacuated?

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(1)

Suggest an appropriate material for the outer case.

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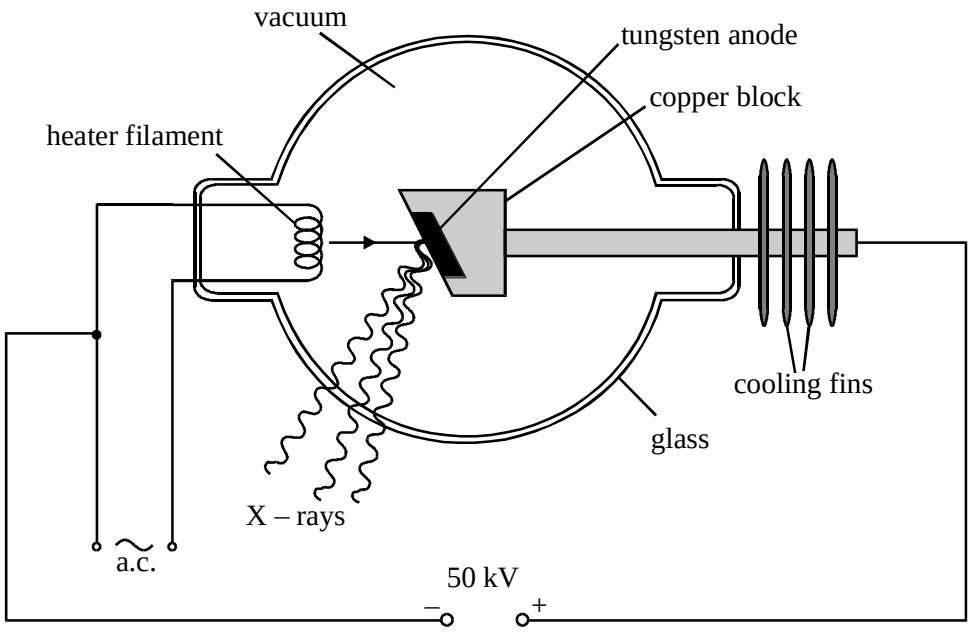
(1)

(Total 4 marks)

5. The diagram shows the construction of an X-ray tube. Electrons are emitted by the hot filament and fired at the tungsten anode where they are rapidly slowed down and produce X-rays.



(a) (i) Name the process in which electrons are emitted by a hot filament.

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(1)

(ii) Describe the energy transfers as the electrons move from the filament to the tungsten anode to produce X-rays.

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(3)

(iii) What is the source of energy for the electrons?

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