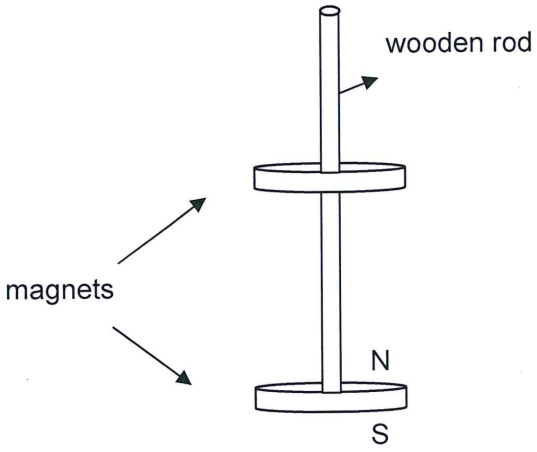
Exam Questions
Chapter 5.2 - Generators
Question 1 2010:1:13

(4 marks)

Below is a diagram of a wooden rod on which there are two powerful magnets, one 'floating' above the other.

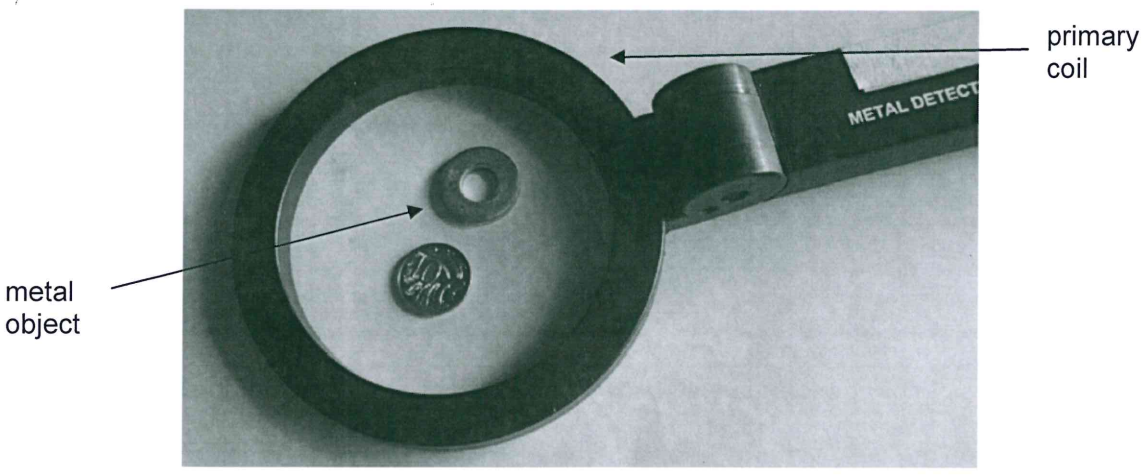


(a) Indicate the north pole of the floating magnet and draw the magnetic field lines between the magnets. (2 marks)

(b) Explain why the top magnet 'floats'. (2 marks)

Question 2 2010:2:15

(12 marks)



Above is a picture of a metal detector and a metal object. A ten cent coin has been added to give a sense of scale. The detector consists of a DC battery connected to a primary coil. There is a secondary coil connected to a buzzer that makes a sound when the primary coil moves over a metal object.

(a) Explain the principle of operation of this metal detector. In your answer, explain why the coil has to be moved while locating metal objects. (4 marks)

Exam Questions
Chapter 5.2 - Generators
Question 2 continued

(b) What type of metal can the detector find? Circle the correct answer. (1 mark)

copper and tin iron and steel any metal

(c) Use the following data to **estimate** the voltage in the secondary buzzer circuit. (5 marks)

Magnetic field strength within primary coil = 0.0500 Wb

Number of turns in secondary coil = 10

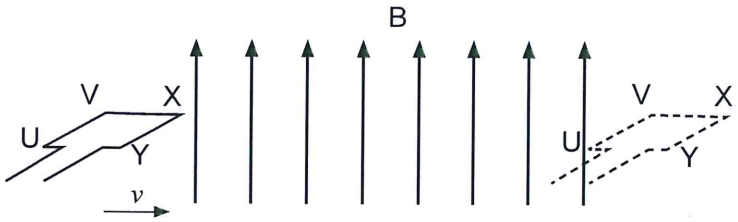
Time of sweep = 0.5 s

(d) How would the sound change if the metal detector was held stationary near a nail? Give a brief reason for your answer. (2 marks)

Exam Questions
Chapter 5.2 - Generators
Question 3 2014:2:17

(17 marks)

As a rectangular coil loop (UVXY) is moved from left to right, it enters a uniform magnetic field, B, as shown in the diagram below. The plane of the loop is perpendicular to the magnetic field lines. According to Faraday's law, an emf must be induced in the loop. Assume that the emf induced in the U-V-X-Y direction is negative, while in the Y-X-V-U direction the emf is positive.

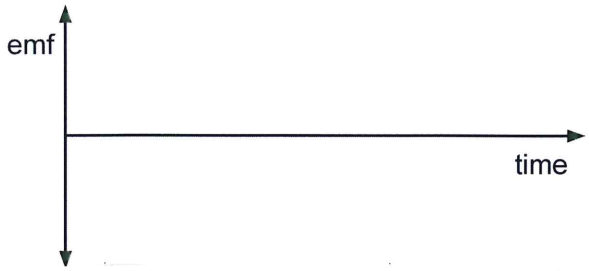


(a) A meter is connected to the loop to measure the emf generated in the circuit during one movement through the field. Fill in the following details of the meter: (2 marks)

Type of meter: _____ Unit of measurement: _____

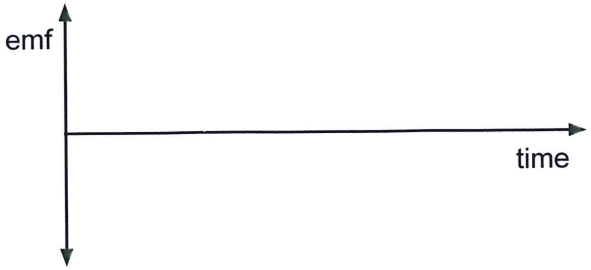
(b) During a second movement through the field, a light globe is attached between U and Y, making a circuit. Explain why the loop requires a force when entering and leaving the magnetic field. (4 marks)

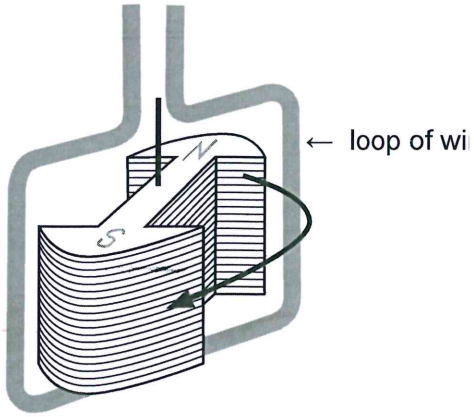
(c) Given that the velocity of the loop is constant, complete the graph below for the emf induced in the loop over the time that it moves into and out of the field. (4 marks)



(d) Another method of generating an emf is to move the magnet in a circular motion as shown in the diagram below.

(i) Complete the graph below for the emf induced in the loop of wire over one complete rotation of the magnet. (3 marks)





(ii) The loop of wire above is a square 5.00 × 5.00 cm. If the magnet rotates once every 1.00 s and has a magnetic field strength of 0.789 T, calculate the magnitude of the maximum emf generated. Assume that the field is completely reversed in the loop during the magnet's rotation. Show **all** workings. (4 marks)