

ELECTROMAGNETIC RADIATION AND MAGNETISM

INSTRUCTIONS

Write all numbers with a **comma** eg 0,71

Do not leave spaces between the number and the unit eg 0,71Hz

If there are two steps to a calculation there will be two blocks provided. Fill in the answers in the correct order.

Metres per second can be written as m.s-1

Round final answers off to two decimal places where necessary

When answers are very small or very big, write in scientific notation and still round off to **two decimal places**

FORMULA : $c = f\lambda$ $E = hf$ $c = 3 \times 10^8 \text{ m.s}^{-1}$ $h = 6,63 \times 10^{-34} \text{ J.s}$

SECTION A : CHOOSE THE CORRECT OPTION FORM THE CHOICES GIVEN.

- 1.1 Red light has a longer or shorter wavelength than violet light (1)
- 1.2 Light travels in little packets of energy called protons or photons (1)
- 1.3 If the frequency of an electromagnetic wave is doubled then the energy of the wave would double or halve (1)
- 1.4 The relationship between the energy of a wave and the wavelength is inversely proportional or directly proportional (1)

- 1.5 Radio waves do or do not need a medium for propagation though the Earth's atmosphere (1)
- 1.6 An electromagnetic wave consists of an electric field and a magnetic field travelling at right angles or parallel to each other (1)
- 1.7 Electromagnetic wave arise from charges that are accelerating or moving at constant velocity (1)
- 1.8 True north on Earth is indicated by the geographical north pole or the magnetic north pole (1)
- 1.9 Aurorae occur in the Earth's thermosphere or magnetosphere (1)
- 1.10 Inside a bar magnet the magnetic field lines run from N to S or S to N (1)
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SECTION B :

Choose from either:

gamma rays / radio waves / x-rays/ visible light / infrared rays / ultraviolet rays / microwaves

(answers may be used more than once or not at all)

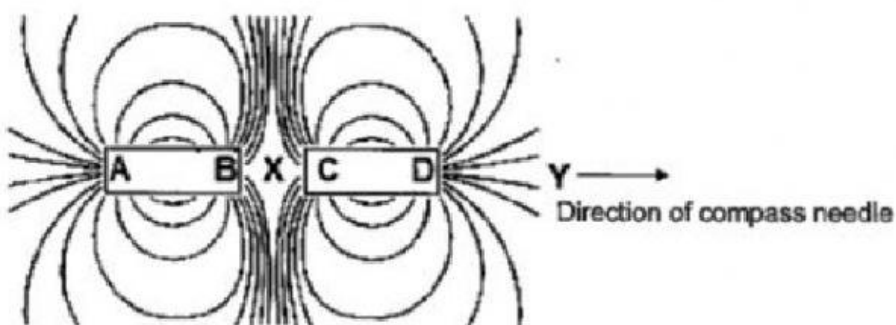
Name the part of the electromagnetic spectrum that

- 2.1 is used to take photo images on photographic film for medical diagnosis (1)
- 2.2 can be detected by the human eye (1)

- 2.3 is used for marine and airway communication (1)
- 2.4 is used for cooking food (1)
- 2.5 can cause mutations and chromosomal defects (1)
- 2.6 have the highest energy (1)
- 2.7 have the longest wavelength (1)
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SECTION C :

The diagram below shows the magnetic field pattern of two identical bar magnets with ends AB and CD



- 3.1 A small piece of ferromagnetic material is placed at point X exactly in the middle of the arrangement. Will the material move? Yes or No. (1)

What type of pole are the following? (Choose from N or S)

- 3.2 D (1)
- 3.3 B (1)

SECTION D: CONVERSIONS AND CALCULATIONS**Convert the following**

4.1 $50\text{nm} \rightarrow$ m (1)

4.2 $500\text{ kJ} \rightarrow$ J (1)

4.3 $200\text{ km.h}^{-1} \rightarrow$ m.s^{-1} (1)

4.4 $70\text{m.s}^{-1} \rightarrow$ km.h^{-1} (1)

Calculate the following

4.5 the energy of a radio wave with a frequency of 50MHz.

$E =$ (1)

4.6 the frequency of an EM wave with a wavelength of $3,5 \times 10^{-2}\text{ m}$

$f =$ (1)

4.7 the frequency of a quantum of light with an energy of $4,2 \times 10^{-11}\text{ J}$

$f =$ (1)

4.8 the wavelength of an EM radiation with an energy of $3,5 \times 10^{-8}\text{ J}$

$f =$ (1)

$\lambda =$ (1)

4.9 the wavelength of a radio wave if a signal produces 6×10^4 vibrations every 2 seconds.

$f =$ (1)

$\lambda =$ (1)