PHYSICAL SCIENCE **GRADE 10**

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

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)

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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)

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)

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2.3 is used for marine and airway communication (1)

2.4 is used for cooking food (1)

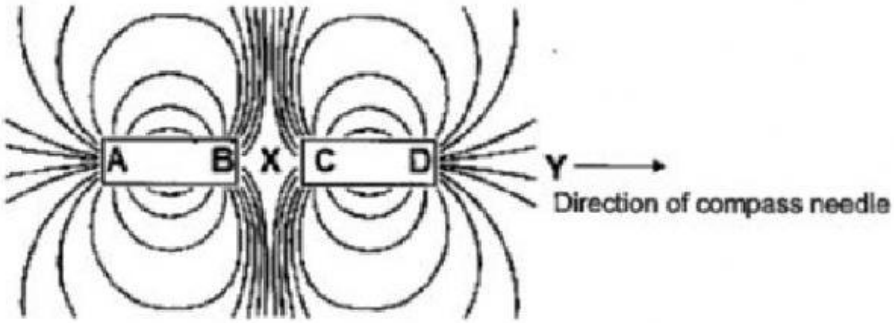
2.5 can cause mutations and chromosomal defects (1)

2.6 have the highest energy (1)

2.7 have the longest wavelength (1)

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)

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3.4 A (1)

SECTION D: CONVERSIONS AND CALCULATIONS

Convert the following

4.1 50nm → m (1)

4.2 500 kJ → J (1)

4.3 200 $km.h^{-1}$ → $m.s^{-1}$ (1)

4.4 70$m.s^{-1}$ → $km.h^{-1}$ (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 x 10^{-2} m

f = (1)

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

f = (1)

4.8 the wavelength of an EM radiation with an energy of 3,5 x 10^{-8} J

f = (1)

λ = (1)

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

f = (1)

λ = (1)

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