Bright Mind Tutors
Your Guide to Greatness

SUBJECT – IGCSE PHYSICS

TIME – 30min

MARKS- 36

KINDLY FOLLOW THE QUESTION ORDER OF THIS PAPER ONLY. DON'T DO YOUR OWN NUMBERING.

**1** Different types of waves are used in hospitals.

(a) Some of the waves used are electromagnetic.

(i) Which of these properties is the same for all electromagnetic waves?

**(1)**

- ☐ **A** amplitude
- ☐ **B** frequency
- ☐ **C** speed in free space
- ☐ **D** wavelength in free space

(ii) Draw a line linking each type of electromagnetic wave with its use.

**(2)**

| **type of electromagnetic wave** | **use** |
|---|---|
| gamma rays | heating food for patients |
| microwaves | imaging broken bones |
| x-rays | with medical tracers |

(iii) Electromagnetic waves are transverse.

Describe how the vibrations of a transverse wave relate to the direction in which the wave travels.
You may draw a diagram to help your answer.

**(1)**

(c) (i) State the equation linking wave speed, frequency and wavelength.

**(1)**

(ii) The speed of radio waves is 300 000 000 m/s.

A radio wave has a frequency of 31 MHz.

Calculate the wavelength of this radio wave.

**(3)**

wavelength = ..... m

(d) A sound wave and a radio wave have the same wavelength.

State why they have different frequencies.

**(1)**

.....

.....

.....

(b) Two students investigate the speed of sound waves in air.

They use a stopwatch that shows times to the nearest 0.1 s.

They use an outdoor running track as their measure of distance.

The track is straight and 100 m long.

Describe what else they must do to obtain a value for the speed of sound. **(separate only**

(5)

(b) A student writes some sentences about electromagnetic waves.

His teacher circles a mistake in each sentence.

In the table, write a suitable correction for each mistake.

The first one has been done for you.

(5)

| Sentence | Correction |
|---|---|
| Electromagnetic waves travel at $3 \times (10^2)$ m/s in a vacuum. | $10^8$ |
| (Sound) waves are electromagnetic. | |
| (Infra-red) waves are the most harmful to people. | |
| (Gamma) waves are used for heating up food. | |
| (Radio) waves have the highest frequency. | |
| (Gamma) waves have a very long wavelength. | |

(b) The Astra satellite takes 24 hours to orbit the Earth once.

It travels at a speed of 3.1 km/s.

Calculate the orbital radius of the satellite and give the unit.

**(4)**

orbital radius = ..... unit .....

(c) The Astra satellite orbits above the equator and travels in the same direction as the rotation of the Earth.

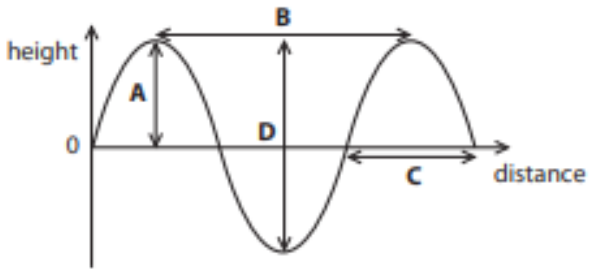
Suggest why this type of 24-hour orbit is an advantage for communications.

**(1)**

.....

.....

**4** The diagram shows part of a water wave.




(a) (i) Which letter represents the wavelength?

(1)

- ☐ **A**
- ☐ **B**
- ☐ **C**
- ☐ **D**

(ii) Which letter represents the amplitude?

(1)

- ☐ **A**
- ☐ **B**
- ☐ **C**
- ☐ **D**

(iii) This water wave is transverse. Other waves can be longitudinal.

State a similarity and a difference between a transverse wave and a longitudinal wave.

(2)

similarity .....

.....

difference .....

.....

**(ii)** State what happens to the amplitude and the wavelength of the wave if

**1.** the loudness of the sound is increased at constant pitch,

amplitude .....

wavelength .....
[1]

**2.** the pitch of the sound is increased at constant loudness.

amplitude .....

wavelength .....
[1]

**(b)** A ship uses pulses of sound to measure the depth of the sea beneath the ship. A sound pulse is transmitted into the sea and the echo from the sea-bed is received after 54 ms. The speed of sound in seawater is 1500 m / s.

Calculate the depth of the sea beneath the ship.

depth = .....[3]

**2** **(a)** A sound wave in air consists of alternate compressions and rarefactions along its path.

**(i)** Explain how a compression differs from a rarefaction.

.....

.....[1]

**(ii)** Explain, in terms of compressions, what is meant by

**1.** the wavelength of the sound,

.....

.....[1]

**2.** the frequency of the sound.

.....

.....[1]