Year 10 X1-X4 Physics work  Time: Approx. 1.5 hours

- We will continue with a review of topics covered in year 10 so far in preparation for your mock exam in May.

In this session, we will revisit the following topics:-

- Topic 4 Waves
- Topic 5 Light and the Electromagnetic Spectrum.

**TASK 1**

- Please complete any outstanding work from last week.
- Complete the revise/test activities on the following BBC bitesize links below:-
  
  https://www.bbc.co.uk/bitesize/topics/zt4gfcw
  
  https://www.bbc.co.uk/bitesize/topics/zxr3ng8

**TASK 2**

- Use your revision guide and/or class notes to complete the revision mats for topics 4 & 5.

**Extension:-**

- If time allows complete the GCSE exam questions below. (Mark scheme included at the end).

**Any question please ask.**  r.ram@bishopchalloner.bham.sch.uk
Q1.

The diagram below shows a ripple tank that a student used to investigate water waves.

(a) The student adjusted the speed of the motor so that the bar hit the water more times each second.

What happened to the frequency of the waves produced?

Tick one box.

- Decreased
- Did not change
- Increased

(1)

(b) Describe how the frequency of the water waves in the ripple tank can be measured.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(2)
(c) The student measured the frequency of the water waves as 5 hertz. Calculate the period of the water waves.

Use the equation:

\[ \text{period} = \frac{1}{\text{frequency}} \]

Choose the unit.

<table>
<thead>
<tr>
<th>metres</th>
<th>metres / second</th>
<th>seconds</th>
</tr>
</thead>
</table>

|                      |                      |                     |
|                      |                      |                     |
|                      |                      |                     |
|                      |                      |                     |

Period = ____________________ Unit = ____________________

(3) (Total 6 marks)

Q2. Which one of the following is not an electromagnetic wave?

Tick one box.

Gamma rays

Sound

Ultraviolet

X-rays

(1)

(b) What type of electromagnetic wave do our eyes detect?

___________________________________________________________________

(1)
(c) What is a practical use for infrared waves?

Tick one box.

- Cooking food
- Energy efficient lamps
- Medical imaging
- Satellite communications

(1)

Scientists have detected radio waves emitted from a distant galaxy.

Some of the radio waves from the distant galaxy have a frequency of 1 200 000 000 hertz.

(d) Which is the same as 1 200 000 000 hertz?

Tick one box.

- 1.2 gigahertz
- 1.2 kilohertz
- 1.2 megahertz
- 1.2 millihertz

(1)
(e) Radio waves travel through space at 300 000 kilometres per second (km/s).

How is 300 000 km/s converted to metres per second (m/s)?

Tick one box.

- $300 000 \div 1000 = 300 \text{ m/s}$
- $300 000 \times 1000 = 300 000 000 \text{ m/s}$
- $300 000 + 1000 = 301 000 \text{ m/s}$
- $300 000 - 1000 = 299 000 \text{ m/s}$

(f) Write the equation which links frequency, wavelength and wave speed.

______________________________________________________________

(g) Calculate the wavelength of the radio waves emitted from the distant galaxy.

Give your answer in metres.

______________________________________________________________

______________________________________________________________

wavelength = ____________________ m

(Total 9 marks)

Q3.

Small water waves are created in a ripple tank by a wooden bar. The wooden bar vibrates up and down hitting the surface of the water.

The figure below shows a cross-section of the ripple tank and water.
(a) Which letter shows the amplitude of a water wave?
Tick one box.

J
K
L

(b) The speed of the wooden bar is changed so that the bar hits the water fewer times each second.

What happens to the frequency of the waves produced?

Tick one box.

Increases
Does not change
Decreases

(c) Describe how the wavelength of the water waves in a ripple tank can be measured accurately.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(2)
(d) The speed of a wave is calculated using the following equation.

\[ \text{wave speed} = \text{frequency} \times \text{wavelength} \]

The water waves in a ripple tank have a wavelength of 1.2 cm and a frequency of 18.5 Hz.

How does the speed of these water waves compare to the typical speed of a person walking?

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

(4) (Total 8 marks)

Q4. The figure below shows an X-ray image of a human skull.

(a) Use the correct answers from the box to complete the sentence.

<table>
<thead>
<tr>
<th>absorbs</th>
<th>ionises</th>
<th>reflects</th>
<th>transmits</th>
</tr>
</thead>
</table>

When X-rays enter the human body, soft tissue __________________________
X-rays and bone ______________ X-rays.

(b) Complete the following sentence.
The X-rays affect photographic film in the same way that ______________ does.

(c) The table below shows the total dose of X-rays received by the human body when different parts are X-rayed.

<table>
<thead>
<tr>
<th>Part of body X-rayed</th>
<th>Dose of X-rays received by human body in arbitrary units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>3</td>
</tr>
<tr>
<td>Chest</td>
<td>4</td>
</tr>
<tr>
<td>Pelvis</td>
<td>60</td>
</tr>
</tbody>
</table>

Calculate the number of head X-rays that are equal in dose to one pelvis X-ray.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Number of head X-rays = _________________________

(d) Which **one** of the following is another use of X-rays?

Tick (✓) one box.

Cleaning stained teeth

Killing cancer cells

Scanning of unborn babies

(Total 6 marks)
Mark schemes

Q1.
(a) increased 1

(b) (count) how many waves pass a point in one second 1

in one second

this is dependent on the first mark point being awarded 1

or

(count) number of waves that pass a point in a given time allow a specific time for a given time

or

(count) number of waves that are produced in a given time (1) and divide by that time in seconds

this is dependent on the first mark point being awarded allow an answer in terms of measuring the frequency of the vibrating bar

period = \frac{1}{5} 1

period = 0.2 1

seconds / s 1

[6]

Q2.
(a) sound 1

(b) (visible) light 1

(c) cooking food 1

(d) 1.2 gigahertz 1

(e) \(300 \times 1000 = 300000000\) m/s 1
(f) wave speed = frequency × wavelength
   \[ v = f \lambda \]  
1

(g) \[ 300\,000\,000 = 1200\,000\,000 \times \lambda \]
   an answer of 0.25 scores 3 marks
1

\[ \lambda = \frac{300\,000\,000}{1200\,000\,000} \]
   allow ecf from (e)  
1

\[ \lambda = 0.25 \text{ (m)} \]  
1

[10]

Q3.

(a) K  
1

(b) Decreases  
1

(c) use a metre rule / 30 cm ruler to measure across 10 (projected) waves
   accept any practical number of waves number for 10
   and then divide by 10  
1

(d) 1.2 cm = 0.012 m  
1

\[ 18.5 \times 0.012 = 0.22(2) \text{ (m / s)} \]  
allow 0.22(2) with no working shown for 2 marks
1

typical walking speed = 1.5m / s
   accept any value e.g. in the range 0.7 to 2.0 m / s  
1

so the water waves are slower (than a typical walking speed)
   this cannot score on its own  
1

[8]
Week beginning 30\textsuperscript{th} March 2020

Q4.

(a) transmits

\textit{correct order}

absorbs

1

(b) light

\textit{allow ultra violet or UV or infrared or IR or gamma}

1

(c) 20

\textit{allow 1 mark for correct working, ie} \frac{60}{3} \textit{provided no subsequent step}

2

(d) Killing cancer cells

1