Waves, Sound and Light Test Memo

QUESTION 1:

1.1)B.
1.2)A.
1.3)A.
1.4)A.
1.5)C (5x2=10)

QUESTION 2:

2.1) Frequency is the amount of waves that move beyond a fixed point in one second. (2)
2.2)
2.2.1)

$\mathbf{T} = \frac{\mathbf{1}}{\mathbf{f}}$. Thus f = 1/8 = 0,125 Hz.

$\boldsymbol{E} = \boldsymbol{hf}$ = (6,63 x 10^{-34})(0,125) = 8,2875.. x 10^{-35} J.

$\mathbf{E} = \frac{\mathbf{h\,c}}{\lambda}$

(8,287..x10^{-35}) = $\frac{(6{,}63\ x\ 10^{-34})(3\ x\ 10^{8})}{\lambda}$

ƛ = 2,4 x 10^{9}m. (7)

2.3)

$$\boldsymbol{E = hf}$$

(1,99 x10^{-33}) = (6,63 x10^{-34})(f)
f = 3,001..Hz.

thus Period:

$\mathbf{T = \frac{1}{f}}$ = 1/3,001=0,33 seconds. (5)

QUESTION 3:

3.1)
3.1.1) Yellow light:

$$\boldsymbol{E = hf}$$

(3,48x10^{-19}) = (6,63 x10^{-34})(f)
f = 5,248..x10^{14}Hz.

i.e. red light's frequency = ¼ (5,248..x10^{14})=1,31 x10^{14}Hz. (5)

3.1.2) According to the following equation $\mathbf{V = f\lambda}$ the speed will increase if the frequency decreases and the wavelength increases. Red light will therefore have the higher speed, because the frequency of red light is smaller than yellow light, but with a larger wavelength and therefore the speed will increase.
(3)

3.1.3)
Radio 1:
1..)
$\mathbf{T = \frac{1}{f}}$= 1/3 = 0,33s.
E =hf = (6,63 x10^{-34})(0,33) = 2.19 x 10^{-34} J.

Radio 2:

$\mathbf{T = \frac{1}{f}}$ =1/8 =0,125s
E=hf =(6,63 x10^{-34})(0,125)=8,29 x10^{-35}J.

Radio 1 has the largest energy. (6)

3.2)
Infrared:

- Heating.
- Remote control.

Gamma ray:
Radiation. Destruction. (4)

QUESTION 4:

4.1) Energy is inversely proportional to the wavelength. (2)

4.2)

As $\frac{1}{\lambda}$ = 0.09 thus is ƛ = 1,11m.

The slope appears constant and therefore indicates the constants hc.

$$\mathbf{E} = \frac{\mathbf{h\,c}}{\lambda}$$

$$\mathbf{X} = \frac{(6{,}63\,x\,10^{-34})(3\,x\,10^{8})}{(11{,}11)}$$

= 1,79 x10^{-26}J. (5)

4.3)

$$\boldsymbol{E = hf}$$

(3.02 x10^{-19}) = (6,63 x10^{-34})($\frac{2{,}5\,x\,10^{3}}{\lambda}$)

ƛ = 5,48 x 10^{-12}m. (5)

QUESTION 5:

5.1) Sound that can produce a frequency of 20 000Hz and higher. (2)

5.2)

$T = \frac{1}{f} = \frac{1}{20\,000} = 5\,x\,10^{-5}s.$

5.3)

Airplane 1:

$V = \frac{D}{t}$

340 = $\frac{3000}{t}$

t = 8,82s.

i.e. Airplane 2's time = 1/3 (8,82) = 2,94s. (4)

NB: A TIME THAT MOVES 3 TIMES FASTER IS THEREFORE MULTIPLIED BY 1/3 AND NOT BY 3.

QUESTION 6:

6.1)

6.1.1) They are points with:

- Equal speed.
- The same side.
- Movement in the same direction.

(3)

6.1.2) Red. (1)