

4/11/24

unit - 8

book back

Exercise problem

xii physics  
problem with solutions

w-watt

5 marks

1)

$$d = 50 \text{ nm} = 50 \times 10^{-9} \text{ m}$$

$$\lambda = 640 \text{ nm} \quad \lambda = 640 \times 10^{-9} \text{ m}$$

$$e = \frac{hc}{\lambda} \quad E = \frac{hc}{\lambda}$$

$$h \rightarrow \text{Planck's constant } (6.626 \times 10^{-34} \text{ Js})$$

$$\lambda \rightarrow \text{wavelength } (640 \times 10^{-9} \text{ m}) \quad e = 1.6 \times 10^{-19}$$

$$c \rightarrow \text{velocity of light } (3 \times 10^8 \text{ ms}^{-1})$$

$$e = \frac{6.626 \times 10^{-34} \times 3 \times 10^8}{640 \times 10^{-9}}$$

$$e = \frac{6.626 \times 3 \times 10^{-34} \times 10^8}{640} \times 10^9$$

$$e = \frac{19.878}{640} \times 10^{-34} \times 10^{17}$$

$$e = 0.3105 \times 10^{-34+17}$$

$$e = 0.3105 \times 10^{-17}$$

$$e = 3.106 \times 10^{-19} \quad \rightarrow \text{①}$$

$$E = ne$$

$$n = \frac{E}{e} = \frac{50 \times 10^{-3}}{3.106 \times 10^{-19}}$$

$$n = \frac{50}{3.106} \times 10^{-3} \times 10^{19}$$

$$= 16.0978 \times 10^{-3+19}$$

$$= 16.0978 \times 10^{16}$$

$$n = 1.60978 \times 10^{17} \text{ g}^{-1}$$

3) solution 413  
 $\lambda = 418 \text{ nm}$

$0.1 \text{ nm}, 10 \text{ m}$   $\lambda = 413 \times 10^{-9}$

1)  $418 \text{ nm}$   $E = \frac{hc}{\lambda e}$   $h \rightarrow$  planck's constant  
 $6.626 \times 10^{-34} \text{ Js}$

$c \rightarrow$  velocity of light  $c = 3 \times 10^8 \text{ ms}^{-1}$

$\lambda \rightarrow$  wavelength

$e \rightarrow$  electron  $1.6 \times 10^{-19} \text{ C}$

$$E = \frac{6.626 \times 10^{-34} \times 3 \times 10^8}{413 \times 10^{-9} \times 1.6 \times 10^{-19}}$$

$$E = \frac{6.626 \times 3 \times 10^{-34} \times 10^8 \times 10^9 \times 10^{19}}{413 \times 1.6}$$

$$E = \frac{19.878}{660.8} \times 10^{-34} \times 10^{26}$$

$$E = 0.030081 \times 10^2$$

$$E = 3.0081 \text{ V}$$

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1)  $0.1 \text{ nm}$

$\lambda = 0.1 \text{ nm}$

$$E = \frac{hc}{\lambda e} \quad h \rightarrow 6.626 \times 10^{-34} \text{ Js}$$

$\lambda = 0.1 \times 10^{-9}$

$e = 1.6 \times 10^{-19} \quad c = 3 \times 10^8 \text{ ms}^{-1}$

$$E = \frac{6.626 \times 10^{-34} \times 3 \times 10^8}{0.1 \times 10^{-9} \times 1.6 \times 10^{-19}}$$

$$E = \frac{6.626 \times 3}{0.1 \times 1.6} \times 10^{-34} \times 10^8 \times 10^9 \times 10^{19}$$

$$E = \frac{19.878}{0.16} \times 10^{-34} \times 10^{26}$$

$$E = 124.2375 \times 10^2$$

$$E = 12424 \text{ eV}$$

$$n) 10 \text{ m} \quad \lambda = 10$$

$$E = \frac{hc}{\lambda e} \quad h = 6.626 \times 10^{-34} \text{ J s}$$
$$c = 3 \times 10^8 \text{ m s}^{-1} \quad \lambda = 10 \text{ m}$$
$$e = 1.6 \times 10^{-19} \text{ C}$$

$$E = \frac{6.626 \times 10^{-34} \times 3 \times 10^8}{10 \times 1.6 \times 10^{-19}}$$

$$E = \frac{6.626 \times 3 \times 10^{-34} \times 10^8 \times 10^{19}}{10 \times 1.6}$$

$$E = \frac{19.878}{16} \times 10^{-34} \times 10^{27}$$

$$E = 1.2423 \times 10^{-7} \text{ eV}$$

3 mark  
question

A)

solution:

$$\lambda = 5500 \text{ \AA}$$

$$= 5500 \times 10^{-10} \text{ m} \quad \text{Efficiency } 12\%$$

$$P = 150 \text{ W}$$

$$e = \frac{hc}{\lambda}$$

$$= \frac{6.626 \times 10^{-34} \times 3 \times 10^8}{5500 \times 10^{-10}}$$

$$= \frac{6.626 \times 3}{5500} \times 10^{-34} \times 10^8 \times 10^{10}$$

$$= \frac{19.878}{5500} \times 10^{-24} \times 10^{18}$$

$$= \frac{19.878}{5500} \times 10^{-16}$$

$$= 0.00361 \times 10^{-16}$$

$$= 3.614 \times 10^{-19}$$

$$n = \frac{E}{e}$$

$$n = \frac{150}{3.614 \times 10^{-19}}$$

$$= \frac{150}{3.614} \times 10^{19}$$

$$= 41.50 \times 10^{19}$$

$$= 4.150 \times 10^{20}$$

Efficient 12%.

$$= \frac{12}{100}$$

$$n = 4.150 \times 10^{20} \times \frac{12}{100}$$

$$n = 4.150 \times 10^{20} \times \frac{12}{100}$$

$$n = 4.150 \times 12 \times 10^{20} \times 10^{-2}$$

$$n = 4.150 \times 12 \times 10^{18}$$

$$n = 49.8 \times 10^{18}$$

$$n = 4.98 \times 10^{19}$$

5) solution:

$$\text{frequency } (\nu) = 10^{14} \text{ Hz}$$

$$\text{Energy } (E) = 19.86 \text{ J}$$

$$E = h \nu$$

$$E = 10^{-34} \times$$

$$E = 6.626 \times 10^{-34} \times 10^{14}$$

$$E = 6.626 \times 10^{-34+14}$$

$$E = 6.626 \times 10^{-20}$$

$$n = \frac{E}{e}$$

$$n = \frac{19.86}{6.626 \times 10^{-20}}$$

$$n = \frac{19.86}{6.626} \times 10^{20}$$

$$n = 2.99 \times 10^{20}$$

$$n = 3 \times 10^{20}$$

2 marks

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2 marks

5/11/24  
Tuesday

Unit-8

B. Book

10) Sum

Numerical problem

Solution

2 mark

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Pg: 128

$$\lambda = \frac{12.27}{\sqrt{V}} \text{ \AA}$$

$$\lambda = \frac{12.27 \text{ \AA}}{\sqrt{81}}$$

$$\lambda = \frac{12.27}{9} \text{ \AA}$$

$$v = 181V$$

$$\lambda = 1.363 \text{ \AA}$$

$$\lambda = 1.363 \times 10^{-10} m$$

10) Sum

Solution:

3 mark

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Pg: 138

$$\text{Light} = 4 \text{ Cal cm}^{-2} \text{ min}^{-1}$$

$$\text{Sun light} = 5500 \text{ \AA} = \lambda$$

$$E = \frac{hc}{\lambda} \quad h = 6.626 \times 10^{-34} \text{ Js}$$

$$c = 3 \times 10^8 \text{ ms}^{-1}$$

$$\lambda = 5500 \times 10^{-10} m$$

$$E = \frac{6.626 \times 10^{-34} \times 3 \times 10^8}{5500 \times 10^{-10}}$$

$$E = \frac{6.626 \times 10^{-34} \times 3}{5500}$$

$$E = \frac{6.626 \times 3 \times 10^{-34} \times 10^8}{5500}$$

$$E = \frac{19.878}{5500} \times 10^{-34} \times 10^8$$

$$E = \frac{19.878}{5500} \times 10^{-26} \text{ J}$$



$$E = 0.003614 \times 10^{-16}$$

$$E = 3.6 \times 10^{-19} \text{ J} \rightarrow \textcircled{1}$$

$$E = ne$$

$$n = \frac{E}{e} \quad E = 4 \text{ cal cm}^{-2} \text{ min}^{-1}$$

$$E = 4 \times 4.2 = 16.8 \text{ J cm}^{-2} \text{ min}^{-1}$$

$$n = \frac{1.68}{3.6 \times 10^{-19}}$$

$$n = \frac{1.68}{3.6} \times 10^{19}$$

$$= 4.666 \times 10^{19}$$

$$n = 4.67 \times 10^{19}$$

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b) sum  
solution

$$\lambda = 4000 \text{ \AA}$$

$$\lambda = \frac{12.27}{\sqrt{v}} \text{ \AA}$$

$$\lambda = \frac{h}{p} \quad p = mv$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$\lambda = \frac{6.626 \times 10^{-34}}{9.1 \times 10^{-31} \times 4000 \times 10^{-10}} \quad \lambda = \frac{h}{mv} \quad v = \frac{h}{m\lambda}$$

$$\lambda = \frac{6.626 \times 10^{-34} \times 10^{+21} \times 10^{+10}}{9.1 \times 4000}$$

$$\lambda = \frac{6.626 \times 10^{-34} \times 10^{+41}}{9.1 \times 4 \times 10^3}$$

$$\lambda = \frac{6.626}{9.1 \times 4} \times 10^{-34} \times 10^{+3} \times 10^{+41}$$

$$\lambda = \frac{6.626}{9.1 \times 4} \times 10^{-27} \times 10^{+41}$$

$$\lambda = 0.182082 \times 10^{+4}$$

$$v = 1820 \text{ m s}^{-1}$$

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 2 mark  
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ii-Mid Term

2 mark

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very imp  
question

Solution

$$v = \sqrt{\frac{2k}{m}} \quad m = 9.1 \times 10^{-31} \text{ kg}$$

$$k \rightarrow eV \quad k = 1.6 \times 10^{-19} \times 81$$

$$= 129.6 \times 10^{-19}$$

$$= 1.3 \times 10^{-17} \text{ J}$$

$$v = \sqrt{\frac{2 \times 1.3 \times 10^{-17}}{9.1 \times 10^{-31}}}$$

$$v = \frac{\sqrt{2} \sqrt{1.3} \times \sqrt{10^{-17}} \times 10^{15}}{\sqrt{9.1}}$$

$$v = \frac{1.414 \sqrt{1.3} \times \sqrt{10}^{14}}{\sqrt{9.1}}$$

$$v = \sqrt{0.2837 \times 10^7}$$

$$v = 0.5345 \times 10^7 \text{ m s}^{-1}$$

Q4/11/2022

$$v = \sqrt{0.2837} \times 10^7$$

$$v = 0.5345 \times 10^7$$

$$v = 5.345 \times 10^6 \text{ m s}^{-1}$$