

Unit 3 practice NAB

1. a) wavelength = $v/f = 340/3400 = 0.1\text{m}$

b) path difference = $1.5 - 1.25 = 0.25\text{m}$
this is 2.5 wavelengths, so destructive interference.

c) too many reflections.

2. a) $3 \times 10^8 \text{ms}^{-1}$.

b) $n = v_1/v_2$ so $1.48 = 3 \times 10^8/v_2$ $v_2 = 2 \times 10^8 \text{ms}^{-1}$.

3. $n = \sin 49/\sin 28 = 1.6$

4. $I_1(d_1)^2 = I_2(d_2)^2$ so $4 \times 2^2 = 0.25 \times d^2$ $d = 8\text{m}$

5. a) energy required to free an electron from an atom.

b) $E = hf = 6.63 \times 10^{-34} \times 1.2 \times 10^{15} = 7.96 \times 10^{-19} \text{ J}$ this > work function so photoelectric effect occurs.

c) $E = hf = 6.63 \times 10^{-34} \times 1.5 \times 10^{15} = 9.95 \times 10^{-19}$
extra energy = $9.95 \times 10^{-19} - 6.4 \times 10^{-19} = 3.55 \times 10^{-19} \text{ J}$

ii) this energy changes to light.

iii) blue (highest frequency)

6. a) fission (1 nucleus becomes 2 nuclei)

b) spontaneous – nucleus breaks up, induced – caused by a neutron.

6. c) i) mass is "lost" in the reaction, this is changed to energy.

$$\text{ii) Mass before} = 390.173 \times 10^{-27} \text{ kg} + 1.675 \times 10^{-27} \text{ kg} \\ = 391.848 \text{ kg}$$

$$\text{mass after} = 232.242 \times 10^{-27} \text{ kg} + 155.883 \times 10^{-27} \text{ kg} \\ + 2(1.675 \times 10^{-27} \text{ kg}) \\ = 391.475 \text{ kg}$$

$$\text{mass lost} = 0.373 \times 10^{-27} \text{ kg}$$

$$\text{energy} = mc^2$$

$$= 0.373 \times 10^{-27} \text{ kg} \times (3 \times 10^8)^2 \\ = 3.36 \times 10^{-11} \text{ J}$$

7. a) the absorbed dose,
the kind of radiation, e.g. γ β α ,, , slow neutron,
or the body organs or tissues exposed.

$$\text{b) } H = D\omega_r \quad (\omega_r \text{ was formerly known as } Q)$$

$$H = (6 \times 10^{-3} \times 1) + (0.5 \times 10^{-3} \times 20)$$

$$H = 16 \times 10^{-3} \text{ Sv}$$