

FORM 5

CHAPTER 7

Paper 1

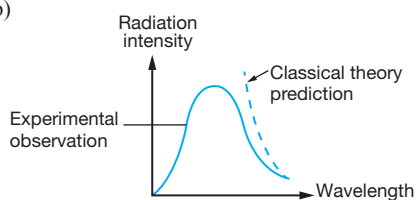
- 1 B 2 A 3 C 4 D 5 B
6 C 7 A 8 A 9 D 10 C

Paper 2

Structured Question

1 (a) A black body is a perfect absorber and emitter of electromagnetic radiation.

(b)



(c) Max Planck stated that the energy of electromagnetic radiation is in discrete packets called quanta. The energy of electromagnetic radiation depends only on the frequency or wavelength of the radiation.

2 (a) $\lambda = \frac{h}{mv}$

The wavelength, λ is inversely proportional to the velocity, v .

(b) $6.12 \times 10^{-34} \text{ m}$

(c) Based on the formula $\lambda = \frac{h}{mv}$, de Broglie wavelength, λ is inversely proportional to mass, m if speed, v is constant. Because the mass of the airplane is greater than the mass of the car, the de Broglie wavelength of the airplane is shorter.

- 3 (a) Photoelectric effect.
(b) $4.68 \times 10^{-15} \text{ J}$
(c) Threshold frequency, $f_0 = 4.37 \times 10^{17} \text{ Hz}$
Light frequency, $f = 1.5 \times 10^{15} \text{ Hz}$
 $f < f_0$. Therefore, no photoelectric effect is observed.

4 (a) A quanta is a discrete packet of energy.

(b) $E = hf$

where E = electromagnetic energy

h = Planck's constant

f = electromagnetic frequency

(c) $5.59 \times 10^{-19} \text{ J}$

(d)

Planck's theory	Classical theory
Electromagnetic energy is in the form of quanta.	Electromagnetic energy is continuous.
Electromagnetic energy depends on frequency or wavelength.	Electromagnetic energy depends on intensity.

- 5 (a) $1.01 \times 10^{15} \text{ Hz}$
(b) $2.1875 \times 10^{12} \text{ s}^{-1}$
(c) $5.44 \times 10^{-2} \text{ W m}^{-2}$
(d) $5.71 \times 10^{-19} \text{ J}$
(e) $1.12 \times 10^6 \text{ m s}^{-1}$