Solution

1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
B	B	B	C	D	C	A	D

1.9

(a) Number of photoelectrons emitted by the metal plate per second

$$= \frac{\text{maximum photoelectric current}}{\text{charge of each photoelectron}}$$

$$= \frac{2.8 \times 10^{-7}}{1.60 \times 10^{-19}}$$ 1M

$$= 1.75 \times 10^{12}$$ 1A

(b) Energy of each photon

$$= \frac{hc}{\lambda}$$ 1M

$$= \frac{6.63 \times 10^{-34} \times 3.00 \times 10^{8}}{480 \times 10^{-9}}$$

$$= 4.144 \times 10^{-19} \text{ J}$$

Number of photons hitting the metal plate per second

$$= \frac{\text{intensity} \times \text{area} \times \text{time}}{\text{energy of each photon}}$$

$$= \frac{0.04 \times (1 \times 10^{-4}) \times 1}{4.144 \times 10^{-19}}$$ 1M

$$= 9.65 \times 10^{12}$$ 1A

(c) Any one of the following: 1A

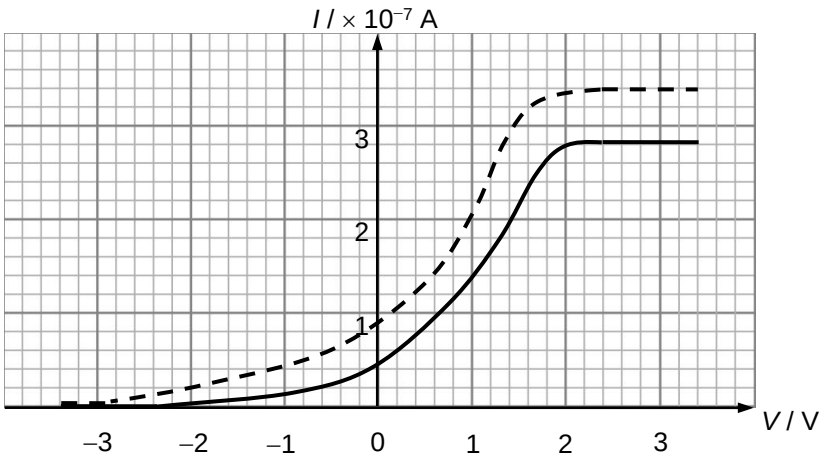
Some photons are not absorbed by electrons in the metal.

The energy that some electrons need to escape from the metal plate is higher than the energy of the photon.

(d) The kinetic energy of a photoelectron is lower than the energy of the photon it absorbs. 1A

Some energy of the photon is used up by the photoelectron to escape from the metal surface. 1A

(e)



(Higher saturated current) 1A

(Higher stopping potential) 1A

Exam Number			

2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
B	A	D	A	C	D	C	C

2.9

(a) The neutrons released after the reaction move at higher speeds. 1A

(b) **(i)** The binding energy of a nucleus is the amount of energy required to completely separate all its constituent nucleons. 1A

(ii) Energy released = increase in binding energy 1M

$= 92 \times 8.513 + 141 \times 8.326 - 235 \times 7.590$

$= 174$ MeV 1A

(iii) Energy released by fission each hour

$= \dfrac{0.18}{235 \times 1.661 \times 10^{-27}} \times 174$ 1M

$= 8.02 \times 10^{25}$ MeV

$= 8.02 \times 10^{25} \times 10^{6} \times 1.60 \times 10^{-19}$

$= 1.28 \times 10^{13}$ J

Power output $= \dfrac{Q}{t}$

$= \dfrac{1.28 \times 10^{13} \times 40\%}{3600}$ 1M

$= 1.42 \times 10^{9}$ W 1A

(c) Control rods absorb neutrons. 1A

More neutrons are absorbed when control rods are inserted deeper into the vessel, hence the rate of fission is reduced. 1A

(d) It slows down the fast-moving neutrons produced by fission reactions (moderator). / It transfers heat released by the fission reactions to the steam generator (coolant). 1A