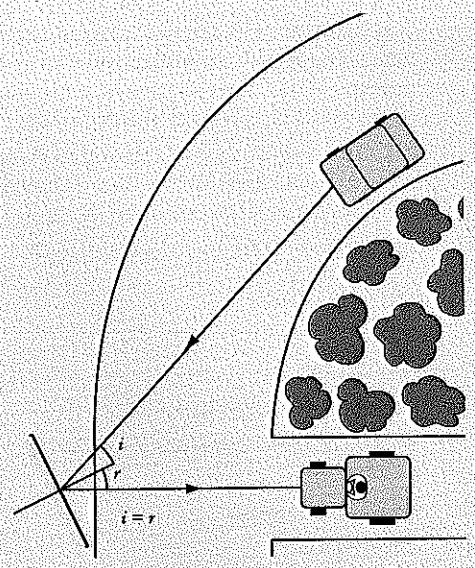
Physics Credit Level 2003

1. (*a*)



(*b*) reversibility of rays
OR mirrors can work in both directions/ways
OR rays can go backwards/other way

2. (*a*) $v = 1{\cdot}2$ m/s

(*b*) $f = 0{\cdot}25$ Hz

(*c*) $\lambda = 4.8$ m

(*d*) $v = \frac{d}{t}$

wave travels $d = 1\lambda$ in 1 period (T)

so $v = \frac{\lambda}{T}$ but $f = \frac{1}{T}$ so $v = \lambda f$

OR

frequency is number of waves/second
wavelength is length of 1 wave
$\Rightarrow f \times \lambda =$ "length" of waves per second $= \frac{d}{t}$

3. (*a*) (i) 230 V
(ii) parallel

(*b*) $I = 0{\cdot}74$ A

(*c*) $R = 481\ \Omega$

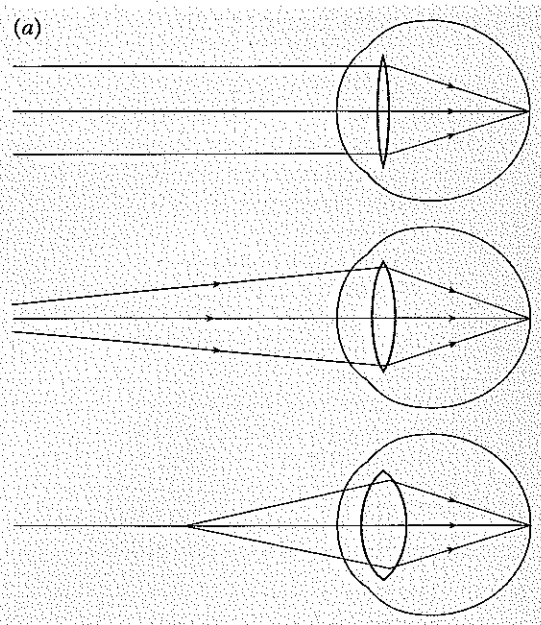
(*d*) To protect the flex/(multi-way) adaptor OR fuse melts instead of flex OR stop flex overheating

4. (*a*) (1 or 5) and (2 or 4) and 3 OR red + green + blue

(*b*) (1 or 5) and 3 OR green + red

(*c*) 2 or 4 OR blue

5. (*a*)



(*b*) 40 D

6. (*a*) 3 A

(*b*) $V = 6$ V

(*c*) $R_y = 6\ \Omega$

(*d*) more current/double current/current = 6 A so total resistance must be reduced/halved

7. (*a*) Time taken for the activity/no. of radioactive nuclei to reduce by one half (of the original value/number)

(*b*) (i) Alpha radiation would (all) be absorbed by the paper
OR
Alpha radiation has too short a range

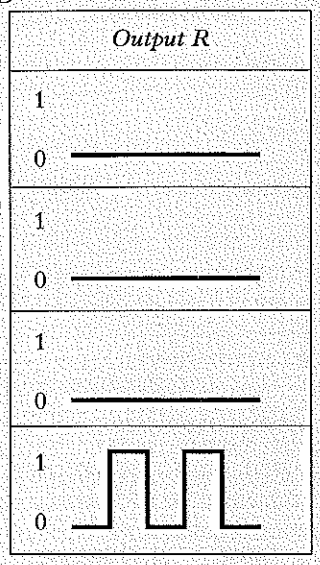
(ii) R
Beta radiation not completely absorbed (by paper)
Long half-life (for continuous operation)

(*c*) To absorb radiation given out in other directions (than towards paper)/safety/to protect workers

(*d*) 4 hours

8. (*a*) AND

(*b*)



(*c*) (*i*) (C discharged, so) X is logic 0, Y is logic 1
C charges (through R)/voltage at X increases (to logic 1) so Y goes to logic 0/
C discharges (through R) so X goes to logic 0, Y to logic 1/repeats

(*ii*) Increase R OR increase C OR increase R and C

9. (*a*) variable resistor

(*b*) (i) transistor
(ii) (electronic/voltage controlled) switch

(*c*) As the temperature changes, the voltage across R/ at the base (of the transistor)/at the junction of P and R changes.
Increase of voltage (at the base of the transistor) causes the transistor to switch on
OR
Decrease of voltage (at the base of the transistor) causes the transistor to switch off.

10. (*a*) (i) first
(ii) second

(*b*) 14 m

(*c*) $a = -4{\cdot}5\ \text{m/s}^2$

11. (*a*) (i) 3 N
(ii) $a = 0{\cdot}5\ \text{m/s}^2$

(*b*) constant/uniform/steady speed because the forces are balanced

12. (*a*) step-down

(*b*) $n_s = 240$ (turns)

(*c*) (i) (A) $P_{out} = 64{\cdot}86$ W
(B) $I_p = 0{\cdot}3$ A

(ii) Any one from:
- power loss due to heating in coils
- power loss due to resistance of wires/coils
- heating in core due to eddy currents
- power/energy loss due to heat/vibration/ sound generated (in the transformer)
- power loss due to hysterisis/magnetising core

Physics Credit Level 2003 (cont.)

13. (*a*) $P = \frac{E}{t} = \frac{mgh}{t}$ $t = 60$ s

$P = \frac{6000 \times 10 \times 5}{60}$

$= 5000$ (W)

(*b*) (i) efficiency = 0·598

(ii) Any two from:
- friction in bearings/wheel/generator
- heating in generator
- resistance in wires
- splashing/water loss (from buckets)

(iii) $t = 700$ s

(iv) Any one from:
- not all the heat is transferred to the air
- movement of air (so greater volume heated)
- heating (the fabric of) the barn
- heat loss to the environment

14. (*a*) electromagnetic spectrum

(*b*) (i) Gamma: sterilising (medical instruments)
Ultraviolet: tanning (with a sun-ray lamp)
Infrared - treating injuries (using a heat-lamp) OR linking (networked) computers (through optical fibres)

(ii) longest wavelength: infrared
highest frequency: gamma

15. (*a*) $t = 0{\cdot}18$ s

(*b*) constant velocity (speed) horizontally and vertical/downwards acceleration (caused by gravity)
OR
no unbalanced force horizontally and vertical/downwards force (of gravity)

(*c*) $d = 0{\cdot}162$ m (= 16·2 cm)