

# Pocket answer section for SQA Standard Grade Physics Credit Level 1998 to 2003

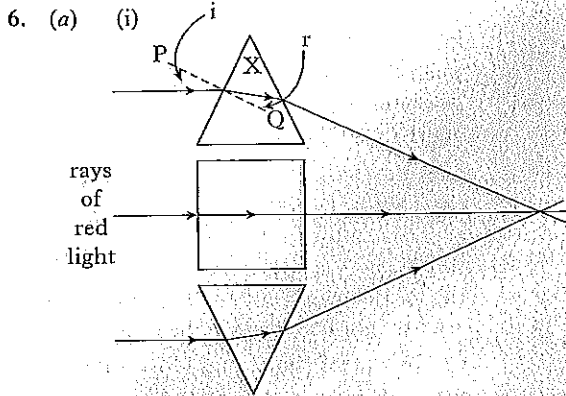
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## Physics Credit Level 2002

1. (a) The transmitter transmits a **radio** signal, which consists of an **audio** wave and a **carrier** wave. The process of combining these waves is known as **modulation**.
  - (b) (i) Any correct answer relating to signal strength—hills/diffraction/distance/interference/far away/out of range  
(ii) (different) frequency/wavelength
2. (a) (i)  $3 \times 10^8$  m/s  
(ii)  $2.8 \times 10^{-3}$  s  
(iii) 2.2 m
  - (b) period 24 hours/1440 minutes  
so always above same point on Earth/  
geostationary
  - (c) 100/101 (minutes)
  - (d) infrared/IR
  - (e) (the) Moon
3. (a) (i)  $8.3 \Omega$   
(ii) resistance is constant since the graph is a straight line through the origin  
or since  $V$  and  $I$  vary universally
  - (b) (i) not a straight line graph/not constant gradient  $\frac{V}{I}$  is not constant/ $R$  increases as  $I$   
(ii) (A) 3.2 A  
(B) 38.4 W
4. (a) (i) (circuit) Y  
(ii) Any two from  
thinner wire/less current per cable/  
convenience (of adding new sockets)/less  
heat/cost/safety/less voltage drop
  - (b) lighting circuit is simple parallel—because  
lower current  
or lighting circuit supplies (fixed) lights not  
sockets—separate circuits  
or lighting circuit uses thinner cables—lower  
current  
or ring circuit has two paths—and  
explanation similar to (a)(ii)  
or different fuse value—because of different  
currents
  - (c) (i) larger current/lot of energy/more power  
(ii) 15 840 000 (J)
  - (d) (i) safety or an implication of safety eg  
prevent electrocution  
(ii) casing live (because of fault); earth wire  
gives low resistance path/large current;  
fuse blows; appliance isolated from supply

**Physics Credit Level 2002 (cont.)**

5. (a) (i) (sounds of)  $f > 20\,000$  Hz  
or sounds above upper frequency/pitch value  
(ii)  $1.25 \times 10^{-5}$  s  
(b) (i) (ultra) sound reflects off baby (in womb)  
reflected (ultra) sound is picked up (by receiver)  
(ii) ultrasound does not damage cells  
or X-rays can damage (living) cells  
or ultrasound is not ionising radiation  
or X-rays are ionising radiation



- (ii) normal  
(iii) may also be shown on bottom prism—  
must include normal

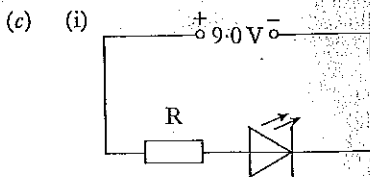
(b) convex (converging)

7. (a) 1 V  
(b) (i) AND  
(ii) OR  
(iii)

P	Q	R	S	T
0	0	0	0	0
0	1	0	0	0
1	0	0	0	0
1	1	1	0	1
0	0	0	1	1
0	1	0	1	1
1	0	0	1	1
1	1	1	1	1

- (iv) to raise the barrier in an emergency/if LDR or pay machine circuit faulty/no money/no change

8. (a) loudspeaker  
(b) filament lamp  
Any one from  
greater light output/white light/LED is a low current device



(ii)  $330\ \Omega$

9. (a) 4200 J  
(b) (i) Q  
(ii) 1.8 m  
(iii) energy is transferred (as heat)  
due to (the force of) friction  
or energy is lost to the system  
or work done against friction
10. (a) 0.5 s  
(b)  $2.0\ \text{m/s}^2$   
(c) (i) 240 m (ii) 28.75 m (29 m)

11. (a) 300  
(b) (i) 4.5 A (ii) 0.23 A  
(c) (i)  $P = I^2 R$  or  $V = IR$   
 $\therefore R = \frac{P}{I^2}$   $\therefore R = V/I$   
 $= \frac{18}{1.5^2}$   $= \frac{12}{1.5}$   
 $= 8.0\ \Omega$   $= 8.0\ \Omega$   
(ii)  $2.7\ \Omega$

12. (a) 15 120 (J)  
(b) (i)  $995\ \text{J kg}^{-1} \text{ } ^\circ\text{C}^{-1}$   
(ii) (A) not all of the energy is transferred as heat to the block  
(B) lag/insulate the aluminium block

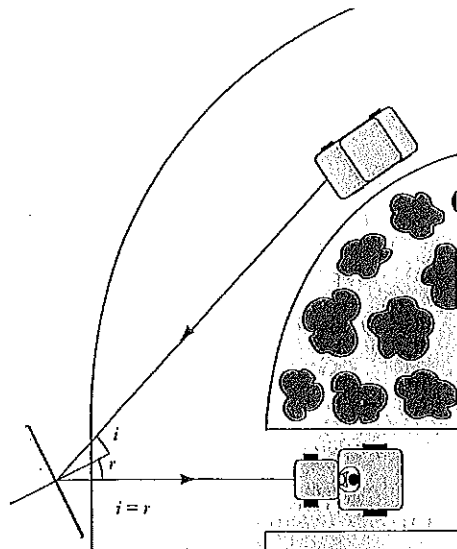
13. (a) weight per unit mass  
or pull of Earth  
force of gravity  
force due to  
gravitational field } per { unit mass  
kilogram

(b)

Stage	Gravitational field strength (N/kg)	Mass (kg)	Weight (N)
on the Moon	1.6	21	33.6
at a point during the journey	0	21	0
on the Earth	10	21	210

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)  $v = 1.2 \text{ m/s}$

(b)  $f = 0.25 \text{ Hz}$

(c)  $\lambda = 4.8 \text{ m}$

(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

$\Rightarrow f \times \lambda = \text{"length" of waves per second} = \frac{d}{t}$

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

(b)  $I = 0.74 \text{ A}$

(c)  $R = 481 \Omega$

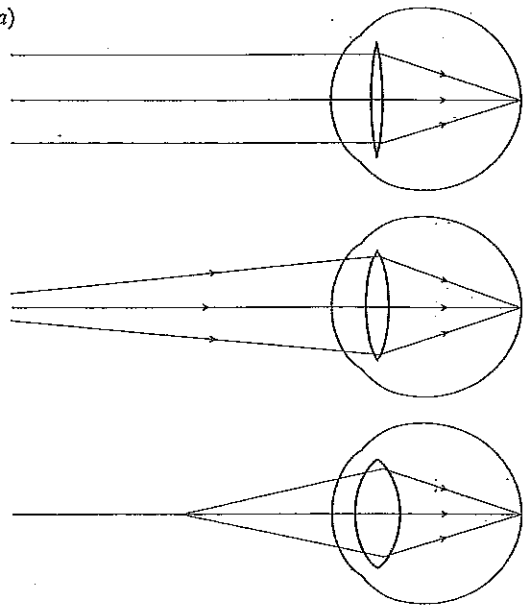
(d) To protect the flex/(multi-way) adaptor OR fuse melts instead of flex OR stop flex overheating

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)  $V = 6 \text{ V}$

(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)

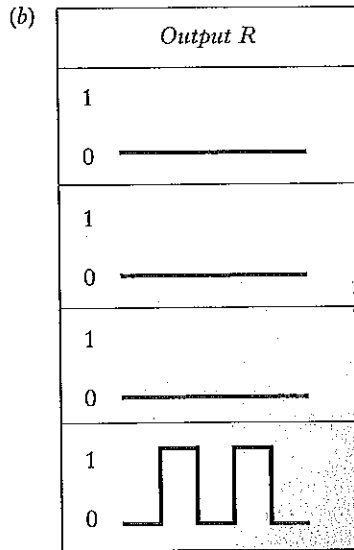
Long half-life (for continuous operation)

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

(d) 4 hours

Physics Credit Level 2003 (cont.)

8. (a) AND



- (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)  $a = -4.5 \text{ m/s}^2$

11. (a) (i) 3 N  
 (ii)  $a = 0.5 \text{ m/s}^2$

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

12. (a) step-down

(b)  $n_s = 240$  (turns)

- (c) (i) (A)  $P_{out} = 64.86 \text{ W}$   
 (B)  $I_p = 0.3 \text{ A}$

- (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 hysteresis/magnetising core

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

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

$$= 5000 \text{ (W)}$$

(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)  $t = 700 \text{ s}$

- (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)  $t = 0.18 \text{ s}$

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

(c)  $d = 0.162 \text{ m} (= 16.2 \text{ cm})$