

Energy, Work and Power

Mark Scheme 7

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Energy, Work and Power
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 7

Time Allowed: 56 minutes

Score: /47

Percentage: /100

- 1 (a) Coal, hydroelectric and wind boxes ticked B2
- (b) (i) Copper is a good conductor of thermal energy/heat
Black surface is a good / the best absorber of radiation/infra red B1
- (ii) (Temp rise =) $72 - 20 = 52 (^{\circ}\text{C})$
(Q =) $mc\Delta\theta$ OR $0.019 \times 4200 \times 52$ C1
4100J A1
- (iii) Efficiency = (power) output / (power) input ($\times 100$)
OR $70 = \frac{(4100 / 5) \times 100}{\text{power input}}$ OR $\frac{(4100 \times 100)}{\text{power input}}$ OR rearranged C1
Power input = 1200 W A1
- [Total: 9]**

- 2 (a) (i) $v = u + at$ OR $(a =) (v - u) / t$ OR $24 = a \times 60$ OR $24 / 60$
 $0.4(0)\text{m/s}^2$ A1
- (ii) $(F =) ma$ OR $7.5 \times 10^5 \times 0.40$ C1
300 000 N OR 300 kN
- (b) (i) in words or symbols $(P =) W / t$ OR $F \times d / t$ OR Fv
OR $7.2 \times 10^4 \times 24 / 1$ OR $7.2 \times 10^4 \times 24$ C1
 $1.7 \times 10^6 \text{ W}$ A1
- (ii) gravitational/potential energy of train has to be increased
OR force acts down the slope/backward force acts (on train) B1
- (for the same distance moved) more work done has to be done OR energy
has to be provided (by the engine) B1
in the same time (so needs more power) B1
- [Total: 9]**

- 3 (a) (i) work done = force x dist or 600×3 or 60×3 or fd or mgh C1
 work = 1800 J c.a.o. accept j or Nm for unit A1 [2]
- (ii) power = work/time or $1800/12$ e.c.f. C1
 power = 150 W e.c.f. accept J/s or NM/s for unit A1 [2]
- (b) P.E. decreases/transformed (ignore mention of KE) C1
 all the decrease becomes heat (ignore mention of sound) A1 [2]
- [Total: 6]**

- 4 (a) (i) down to R and up towards Q/S, then reverse OR equivalent B1
 OR back towards Q, then reverse B1
 continues backward and forward until stops (at R)
- (ii) idea of energy loss OR because of friction NOT PE/KE B1
- (b) (PE lost =) 1.2×0.5 OR 0.6 (J) OR $0.12 \times 10 \times 0.5$ OR mgh OR $wt \times \text{dist}$ C1
 i.e. evidence of m
- $0.5 \times 0.12 \times v^2 = mgh$ OR 0.6 etc. e.c.f. C1
 i.e. evidence of $\frac{1}{2}mv^2$
- 3.16 OR 3.2 m/s c.a.o. A1
- [Total: 6]**

- 5 (a) work = force x distance
 = force of gravity/weight x (vertical) distance/height C1 A1 2
- (b) (i) work = (100 x 8) = 800 J A1 A1 2
- (ii) power = (800/5) = 160 W
- (iii) increases the k.e. of the water (ignore heat/sound) B1 1 [5]

- 6 (a) p.e. lost = mgh or $1 \times 10 \times 7$
 = 70 J C1 A1 [2]
- (b) $70 = 0.5 \times m \times v^2$ or ecf C1
 $v^2 = 140$ or 2 x p.e. C1
 $v = 12 \text{ m/s}$ A1 [3]
- (c) some p.e. changed to heat/sound/either one/work done against air resistance air/resistance acts against the motion B1 [1]

[Total: 6]

7	(a)	time a number of swings (if number stated, >5) time divided by [2 x number of swings]	M1 A1	2
	(b) (ii)	weight of gravity and tension force towards centre of circular motion or towards support point	B1 B1	2
	(c)	p.e. = mgh or $0.2 \times 10 \times 0.$ = 0.1 J	C1 A1	2 [6]