

Energy, Work and Power

Mark Scheme 8

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Energy, Work and Power
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 8

Time Allowed: 51 minutes

Score: /42

Percentage: /100

- 1 (a) $W = mg$ in any form OR $(m =) W \div g$ OR $80\,000 \div 10$
8000 kg C1
A1
- (b) $\rho = m \div V$ in any form OR $(V =) m \div \rho$ OR $8000 \div 1000$
 $= 8.0\text{ m}^3$ ecf (a) C1
A1
- (c) mgh OR weight $\times h$ OR $8000 \times 10 \times 4$ C1
 $= 320\,000\text{ J}$ OR 320 kJ ecf (a) A1
- (d) (efficiency =) output (energy) \div input (energy) ($\times 100$)
OR $96 \div 320 (\times 100)$ C1
 $= 0.30$ OR 30% ecf (c) A1

[Total: 8]

- 2 (a) velocity has direction/is a vector AND speed doesn't/isn't/is a scalar B1
- (b) horizontal arrow to right AND touching parachutist (when extended) B1
arrow/line horizontal AND arrow / line vertical AND making two sides of triangle
OR rectangle
- (ii) correct diagonal (i.e. top left to bottom right) B1
 $10.4\text{--}10.5\text{ m/s}$ B
 $51\text{--}55^\circ$ to horizontal OR $35\text{--}39^\circ$ to vertical (NOT more than 2 sig.figs.) B1
- (iii) $\frac{1}{2}mv^2$ OR $0.5 \times 85 \times 10.5^2$ (e.c.f. from (b)(ii)) C
 $0.5 \times 85 \times 10.5^2$ (e.c.f. from (b)(ii)) C
 $4.7/4.69/4.685625 \times 10^3\text{ J}$ (e.c.f. from (b)(ii)) A [9]

- 3 (a) (mass flow rate =) 1030 (kg/s)
 use of mgh C1
 loss of GPE = $1030 \times 10 \times 3 = 30\,900$ J or Nm ecf from 1st line A1 [3]
- (b) output power = $(26 \times 400 =)$ 10 400 (W)
 efficiency = output (power)/input (power) with/without 100
 OR= output/input with/without 100 OR any numbers
 that clearly show relationship the correct way up is intended C1
 efficiency = $(100 \times 10\,400/30\,900 =)$ 33.7% at least 2 s.f. A1 [3]
 allow ecf from (a) and 1st line of (b)
- (c) (i) from basin/to sea/from right/to left B1
- (ii) turbine design allows rotation in both directions
 OR meaningful comment on change of pitch
 OR generator works when rotating in either direction B1 [2]
- [Total: 8]**
- 4 (a) (The point in the body) where (all) the mass / weight / gravity acts / appears to act B1
 (owtte)
- (b) h is the height through which the centre of mass/rises
 OR centre of mass/rises (much) less than 2.0 m
- OR centre of mass/of athlete is above the ground level
 OR centre of mass/gravity passes under bar B1
- Allow centre of gravity in place of centre of mass
- (c) Standing: has chemical energy B1
 Run-up: kinetic energy gained B1
 Pole bent: has strain / elastic energy B1
 Rise: potential energy gained B1
 Fall: kinetic energy gained B1
 On mat: has thermal / heat / sound / strain / elastic energy B1 [8]

- 5 (a) $Q = mc\Delta T$ in any form or $mc\Delta T$ C1
 $\Delta T = 50$ C1
 $Q = 798\,000\text{ J}$ A1 [3]
- (b) use of $E = Pt$ OR 170×8 OR see 1 360 OR $\times 60$ C1
energy = $(170 \times 8 \times 3\,600) = 4\,896\,000\text{ J}$ A1 [2]
- (c) efficiency = output(energy)/input (energy) OR his (a) \div his (b)
accept power for energy but not wrong/mixed quantities. Accept useful for output,
ignore total for input C1
efficiency = 0.16 or 16% ecf from 6(a) and 6(b) A1 [2]
- (d) source not finite/will not run out ignore can be re-used/replaced
Give for right idea e.g. accept sun always shines B1 [1]
- (e) one point from:
doesn't work at night/cloud cover/no sun/variable output
high (initial) cost (of panels)
do not accept too low unless appropriate for a clearly stated context B1 [1]