M1. (a) (i) 720

*allow **1** mark for correct substitution,*
ie 72 × 10 provided no subsequent step shown

2

(ii) 720**or**their (a)(i)

1

(b) (i) gravitational potential

allow gravitational
allow potential

1

(ii) 432

*allow **1** mark for correct substitution, ie* $\frac{21600}{50}$ *provided no subsequent step shown*

2

watt / W

1

[7]

M2. (a) (i) gravitational potential

accept gravitational

accept potential

1

(ii) 2250 (N)

1

forces must be balanced

or

forces are equal and opposite

*do **not** accept because it is not moving*
*do **not** accept 'equilibrium' by itself*
*do **not** accept 'it is not balanced'*
*do **not** accept 'forces are equal'*
*do **not** accept 'forces are the same'*

1

(b) 1500

***1** mark for correct substitution*

2

[5]

M3. (a) (i) 50 (N)

ignore any units

1

(ii) resultant force

1

(iii) 4000

*accept their (a)(i) × 80 correctly calculated for **2** marks*
*allow **1** mark for correct substitution i.e. 50 × 80 or their (a)(i) × 80*
ignore any units

2

(b) (i) joule

1

(ii) heat

1

[6]

M4. (a) (i) horizontal arrow pointing to the left

judge by eye

drawn anywhere on the diagram

1

(ii) 60 (N)

1

(at steady speed) resultant force must be zero

accept forces must balance/are equal

accept no acceleration

*do **not** accept constant speed*

1

(b) 1680

*allow **1** mark for correct substitution, ie 60 x 28 provided no subsequent step shown*

2

joule

accept J

do not accept j

1

[6]

M5. (a) potential

1

(b) (i) 13 200

*allow **1** mark for correct substitution, ie 660 × 20 provided no subsequent step shown*

2

(ii) 16.5

allow 1 mark for correct

or

$\frac{\text{their (b)(i)}}{800}$ correctly calculated

substitution, ie $\frac{13\,200}{800}$ ***or*** $\frac{\text{their (b)(i)}}{800}$

provided no subsequent step shown

2

[5]

M6.(a) (i) 24

*allow **1** mark for converting time to 600 seconds*
***or** showing method ie 14400/10*

$\frac{14400}{10 \times 60}$

or
provided no further steps shown

2

(ii) 24

ignore any unit
or
their (a)(i)

1

(b) (i) 20 45

***both** required – either order*

1

(ii) the block transfers energy to the surroundings

1

[5]

M7.(a) 1800 (N)

*allow **1** mark for correct substitution ie 180 × 10 provided no further steps shown*

2

(b) 3780**or**
their (a) × 2.1 correctly calculated

*allow **1** mark for correct substitution*
*ie 1800 **or** their (a) × 2.1 provided no further steps shown*

2

joule

accept J
accept any clear indication of correct answer

1

(c) 0

reason does not score if 0 not chosen

1

work is only done when a force makes an object move

accept distance moved is zero
accept no energy transfer (to the bar)
accept the bar is not moving/is stationary
'it' refers to the bar/weights

1

[7]

M8. (a) D

1

(b) C

1

(c) W = 300 × 45

1

W = 13 500

1

*allow 13 500 with no working shown for **2** marks*

(d) straight line drawn from 13 m / s to 0 m / s

1

finishing on x-axis at 65 s

1

[6]