

Mark schemes

- 1.** (a) gravitational potential 1
- kinetic 1
- chemical 1
- (b) flying drones may damage aircraft
or
falling drones may injure people
or
damage buildings / vehicles
allow any sensible suggestion of a hazard caused by a flying / falling drone 1
- (c) energy transferred = power × time
allow $E = Pt$ 1
- (d) $t = 25 \times 60 = 1500$ (s) 1
- $E = 65 \times 1500$ 1
- $E = 97\,500$ (J)
an answer of 97 500 (J) scores 3 marks
allow 2 marks for an answer of 1625 (J) 1
- [8]**
- 2.** (a) chemical 1
- kinetic 1
- in this order only*
- (b) $E_k = 0.5 \times 80 \times 12^2$ 1
- $E_k = 5760$ (J) 1
- an answer of 5760 (J) scores 2 marks*

(c) $E = 0.040 \times 480 \times 50$

1

$E = 960 \text{ (J)}$

1

an answer of 960 (J) scores 2 marks

(d) increased

1

[7]

3.

(a) any **two** from:

- bungee rope may snap
- rope may extend too much
- student may land in the river

2

(b) gravitational potential

correct order only

1

kinetic

1

elastic potential

1

(c) $\frac{1}{2} \times 40 \times 35^2$

1

24 500 (J)

accept 25 000 (J) (2 significant figures)

1

allow 24 500 (J) with no working shown for 2 marks

[7]

4.

(a) (i) 150

1

(ii) transferred to the surroundings by heating

reference to sound negates mark

1

(iii) 0.75

450 / 600 gains 1 mark

accept 75% for 2 marks

maximum of 1 mark awarded if a unit is given

2

(iv) 20 (s)

correct answer with or without working gains 2 marks

correct substitution of 600 / 30 gains 1 mark

2

(b) (i) to avoid bias

1

(ii) use less power and last longer

1

1 LED costs £16, 40 filament bulbs cost £80

or

filament costs (5 times) more in energy consumption

1

(iii) any **one** from:

- availability of bulbs
- colour output
- temperature of bulb surface

1

[10]

5.

(a) 13 500 (J)

allow 1 mark for correct substitution, ie $90 \times 10 \times 15$ provided no subsequent step shown

2

(b) 17

or

$$\sqrt{\frac{\text{their (a)}}{45}}$$

correctly calculated and answer given to 2 or 3 significant figures

accept 17.3

allow 2 marks for an answer with 4 or more significant figures, ie 17.32

or

allow 2 marks for correct substitution, ie $13\,500 / \text{their (a)} = \frac{1}{2} \times 90 \times v^2$

or

allow 1 mark for a statement or figures showing $KE = GPE$

3

(c) work is done

1

(against) friction (between the miner and slide)

accept 'air resistance' or 'drag' for friction

1

(due to the) slide not (being perfectly) smooth
accept miners clothing is rough

or

causing (kinetic) energy to be transferred as heat/internal energy of surroundings
accept lost/transformed for transferred
accept air for internal energy of surroundings

1

[8]