1) A
2) A
3) A
4) C
5) B
6) D
7) C
8) B
9)

(a) (i) change of shape / size / length / dimension C1
when (deforming) force is removed, returns to original shape / size A1 [2]

(ii) $L = ke$ ..... B1 [1]

(b) $2e$ B1
$\frac{1}{2}k$ …(*allow e.c.f. from extension*) B1

$\frac{1}{2}e$ and $2k$ B1

$\frac{3}{2}e$ …(*allow e.c.f. from extension in part 2*) B1
$\frac{2}{3}k$ …(*allow e.c.f. from extension*) ..... B1 [5]

10)

(a) (i) k is the reciprocal of the gradient of the graph C1
k = {32 / (4 × 10^{-2}) = } 800 N m^{-1} A1 [2]

(ii) *either* energy = average force × extension *or* $\frac{1}{2}kx^2$
or area under graph line C1
energy = $\frac{1}{2}$ × 800 × (3.5 × 10^{-2})^2 *or* $\frac{1}{2}$ × 28 × 3.5 × 10^{-2} M1
energy = 0.49 J A0 [2]

(b) (i) momentum before cutting thread = momentum after C1
0 = 2400 × V – 800 × v M1
v / V = 3.0 A0 [2]

(ii) energy stored in spring = kinetic energy of trolleys C1
0.49 = $\frac{1}{2}$ × 2.4 × ($\frac{1}{3}v$)^2 + $\frac{1}{2}$ × 0.8 × v^2 C1
v = 0.96 m s^{-1} A1 [3]
(if only one trolley considered, or masses combined, allow max 1 mark)