2010 SEC 3 PHYSICS END OF YEAR EXAM
ANSWER SCHEME

PAPER 1

1~5: ABBDC **6~10:** ACACD **11~15:** DBCAB
16~20: ADABD **21~25:** BBDAB **26~30:** CABBC

PAPER 2

Q1

(a) Volume of cube = length x height x breadth = 4.0 x 3.0 x 2.0 = 24 cm^3
Density = mass / volume = 36 / 24 = **1.5 g/cm^3**

(b) Its density is greater than that of water.

(c)

Physical quantity	Increase	No change	Decrease
Length of sides of cube		✓	
Mass of cube		✓	
Weight of cube			✓
Density of cube		✓	

Q2

(a) Distance = area under the graph
= (½ x 10 x 8) + (15 x 8) + (½ x 8 x 2.5) OR [½(27.5+15) x 8] = **170 m**

(b) EITHER **25.0 s - 27.5 s**
OR when it is decelerating from **8 m/s to 0 m/s**

(c) Average speed = total distance/total time = 170 / 27.5 = **6.2 m/s**

Q3

(a) **Both** arrows point away from the mass to the ceiling in **both** strings.

(b) Suitable scale, at least ½ of space available; no penalty for awkward scale.
Vector polygon with arrows forming closed triangle.

T_1 and T_2 in acceptable range
i.e. T_1 = **10 N** ± (0.1 cm x scale) & T_2 = **20 N** ± (0.1 cm x scale)

Q4

Take moment abt P,
(500 x 2.0) + (100 x 1.8) = R_Q x 3.6
R_Q = **328 N**

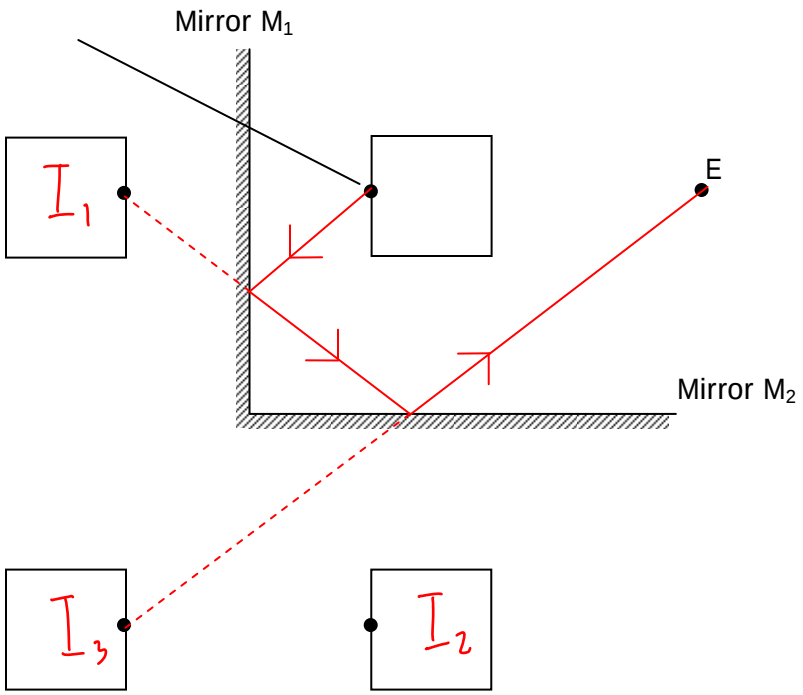
OR

Take moment abt Q,
(500 x 1.60) + (100 x 1.8) = R_Q x 3.6
R_Q = **272 N**

Then,

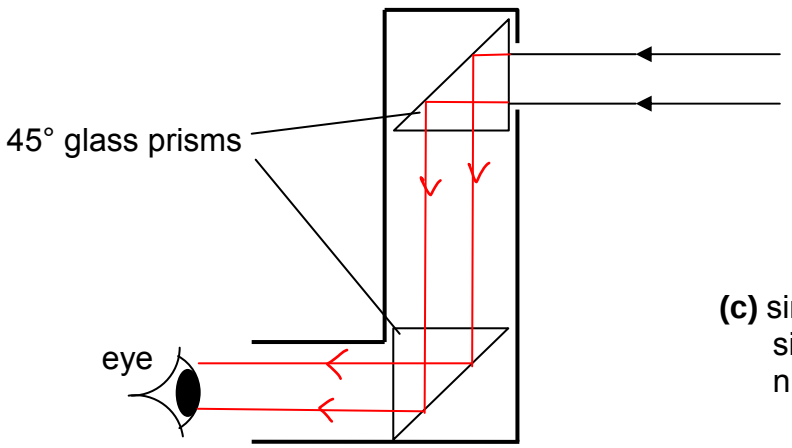
R_P = 500 + 100 – 328 = **272 N** OR R_Q = 500 + 100 – 272 = **328 N**

Q5
(a) & (b)



Q6(a) The light needs to be passing from optically more dense to less dense media OR
The incident ray is in the denser medium.
The angle of incidence needs to be greater than the critical angle.

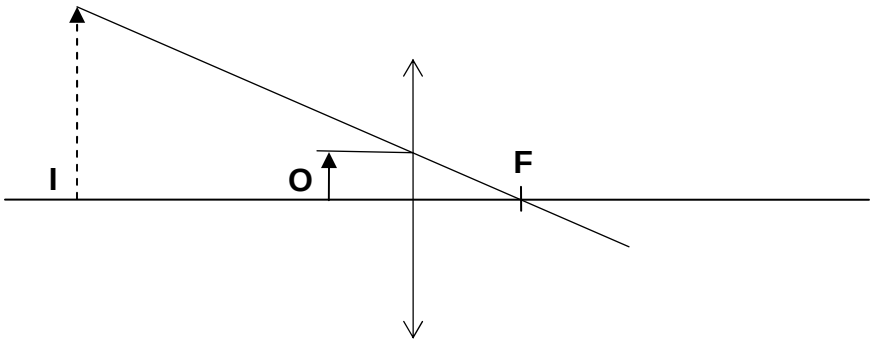
(b)



(c) sin c = 1/n
sin 45^0 = 1/n
n = **1.41**

Q7
(a) The distance between the centre of lens and the principal focus.
OR The distance from the centre of the lens at which parallel rays meet.

(b) (i)



(ii) **12 cm** ± 0.5 cm

(c) magnifying glass OR used to magnify a small object

Q8

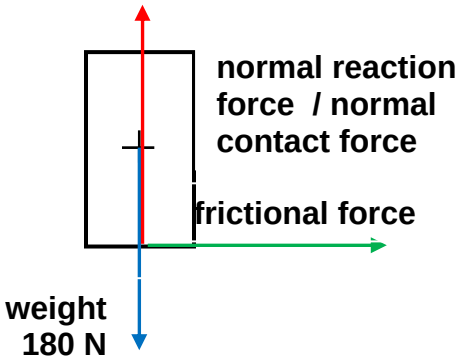
(a) Transverse
(b) Upwards / Up
(c) Downwards / Down
(d) T = 5.0 s f = 1/T hence, f= 1/50 = **0.20 Hz**
(e) v = f λ = 0.2 x 8 m = **1.6 m/s**
(f) No change in frequency

Q9

(a) softer. Amplitude decreasing (b) period / frequency is constant

Q10

(a) NRF starts either from base or centre, friction along bottom. Other positions are not acceptable.



(b) Using F = ma = (18.0) (4.0/5.0) = **14.4 N**

(c) **(i)** The inertia (or mention of Newton's 1st Law) of the box causes it to continue moving forward but the base is prevented from moving forward by the friction, on the surface of the conveyer belt.

(ii) Max angle of tile = $\tan^{-1}(11/40)$ = **15.4°**

(d) Taking moments about the edge,
clockwise moments = anticlockwise moments
F × 80 = 180 × 40 Hence, F = **90 N**

Q11

(a) Weight = **500 N**

(b) **500 N, downwards**

(c) Using v = u + at

0 = u + (-10) (0.7)

u = **7.0 m/s**

(d) **(i)** Using v = u + (-10) (1.04)

v = 0 + (-10) (1.04)

v = **10.4 m/s**

(ii) Using $s = ut + \frac{1}{2} a t^2$

$s = (7.0)(1.74) + \frac{1}{2} (-10) (1.74)^2$

s = **2.96 m**

(e) Yes, The girl will be able to reach the same height.

They will have the same initial velocity and subject to the same deceleration due to gravity. OR mass is not a factor in the appropriate equation of motion.

Q12

(a) Energy cannot be created nor destroyed but can be transformed from one form to another.

(b) GPE = mgh = 0.5 x 10 x 4.0 = **20 J**

(c) (i) $KE = \frac{1}{2} \times m \times v^2 = \frac{1}{2} \times 0.50 \times 4.0^2$ = **4.0 J**

(ii) Work against friction = 1.0 x 3.0 = 3.0 J

KE = 4.0 – 3.0 = **1.0 J**

OR

$a = F/m = -1/0.5 = -2\ m/s^2$

$v^2 = u^2 + 2as = 16 + 2(-2)(3.0) = 4.0$

$KE = 1/2 \times m \times v^2 = 1/2 \times 0.5 \times 4.0$ = **1.0 J**

(iii) KE = 1.0 + 20 = **21 J**

OR

Just before hitting floor, v^2 = (horizontal velocity)^2 + (vertical velocity)^2

$= 2.0^2 + (u^2 + 2as)$

$= 4.0 + (0^2 + 2 \times 10 \times 4.0)$

$= 84$

$KE = 1/2 \times m \times v^2 = 1/2 \times 0.5 \times 84$ = **21 J**

(d) converted into sound energy & heat energy (& some transferred to the floor as the floor's internal energy)