## 2020 Year3 IP EOY Answer Scheme

1	2	3	4	5	6	7	8	9	10
С	С	D	В	D	В	С	В	В	С
11	12	13	14	15	16	17	18	19	20
Α	Α	Α	С	С	В	В	Α	D	D
21	22	23	24	25	26	27	28	29	30
В	В	D	D	В	С	В	С	С	С
31	32	33	34	35	36	37	38	39	40
С	D	C	С	D	В	С	С	В	D

Qns	Answer	Marks
A1(a)	Speed is a scalar quantity. Velocity is a vector quantity	A1
(b)(i)	$W = mg = 75 \times 10 = 750 N$	A1
(b)(ii)	750 N	A1
(c)(i)	54 m s <sup>-1</sup>	A1
(c)(ii)	Area under graph = $54 \times 12 = 648$ m or $650$ m	A1
( <b>d</b> )( <b>i</b> )	Air resistance increases	A1
(d)(ii)	Deceleration or velocity decreases	A1
(e)	Air resistance decrease	A1
A2(a)	Net (unbalanced) force is equal to the product of its mass and acceleration	B1
2(b)(i)	$a = (13 - 9) / (10 - 0) = 0.40 \text{ m s}^{-2}$	M1 A1
2(b)(ii)	$F = ma = 900 \times 0.40 = 360 N$	C1
2(b)(iii)	$F_{net} = 360 \text{ N} = F_{horizontal} - air resistance \& friction - tension$	B1
	$F_{horizontal} = 360 + 520 + 420 = 1300 N$	C1

A3(a)	mass = density × volume = $690 \times 3.0 \times 1.0 \times 0.02 = 41.4$ or $41$ kg	M1 A1
3(b)	The centre of gravity of an object is defined as the point through which its <b>whole weight</b> appears to act for any orientation of the object.	B1
3(c)	Clockwise	
<b>3</b> ( <b>d</b> )	No net moment caused by the CG about the pivot.	
A4(a)	Friction	B1
4(b)(i)	$d_{perpendicular} = 3.0 \times Cos \ 30^{\circ} = 2.59 = 2.6 \text{ m}$	
4(b)(ii)	$90 \times 6.0 = W \times 2.6$ W = 208 N	M1 A1
A5(a)	$\frac{1/2}{v} mv^2 = mgh$ $v = \sqrt{(2gh)} = \sqrt{(2*10**360)} \sqrt{7200} = 84.85$ $v = 84.9 m s^{-1}$	M2 A1
5(b)(i)	Only one force acting on them. Gravitational force which exerts the same acceleration on both coins.	B1
5(b)(ii)	A heavier object needs a <u>larger air resistance to balance</u> its weight and hence it will have a <u>larger falling speed</u> . The converse is also true	B1 B1
Аба	Air particles are contionusly in random motion and collision with surface of mercury.As $P = F/A$ , force acting on the surface of the mercury exerts pressure.	B1 B1
bi	730 + 18 = 748  mm Hg	M1
ii	P = hpg = 0.748*13600*10	M1
	$P = 101728 = 1.02 * 10^5 Pa 3sf$	A1
c	$P = h pg = \{(0.83-0.10-0.30) * 13600 * 10] + [(0.018 * 13600 * 10)]$	M1
	P = 60928 = 60900 Pa or 610 00 Pa {2 or 3 sf]	A1
d	Remians same	A1



<b>B9(a)(i)</b>	magnitude indicated.	M1				
	900 N					
(a)(ii)	vector length shoule be the same with magnitudea indicated 900 N 900 N 900 N					
(a)(iii)	vector length shoule be the significantly longer with magnitudes indicated					
	2400 N 2400 N 900 N					
(b)(i)	1 mark for every 2 correct. No <sup>1</sup> / <sub>2</sub> mark.	A1 A1				
	Distance fallen / m204580					
	Gravitational Potential decreasing decreasing zero Energy / J					
	Kinetic Energy / J   Increasing   decreasing   zero					
	Elastic Potential Energy / J Zero increasing maximum					
(b)(ii)	Net force is upwards.	B1				
(b)(iii)	The forms of energy change will be converted to <u>work done against friction</u> in the bungee cord and eventually it will be <u>converted to heat &amp; sound</u> which will be dissipated into the surroundings. So energy is continually changing its forms & is never lost					

B10 a	Liquid	A1
b	$2.95 * 10^5$ J of thermal energy is needed to change <u>unit mass</u> of a substance X from <u>liquid state to gaseous state without any change in temprature</u> .	B1
с	E = 0.100 * 140 * 37.0	M1
	E = 518 J [2 or 3 sf]	A1
d	$\mathbf{E} = (\ 0.100^{*}\ 140^{*}\ 332) + (0.100^{*}2.95\ ^{*}10^{5})$	M1
	E = 4648 + 29500	M1
	E = 34148 J 34000 J or 34100 J [2sf/3sf]	A1
e	<u>Ave KE decreases</u> gas particles decreases as the temerature of gas decreases	B1
	Rate of <u>collison decreases</u>	B1
	As $P = F/A$ , <u>average force decreases</u> , the pressure of gas decreases	B1
B11a	It is the angle of incidence in the optically denser medium, for which the	B1
	angle of refraction is 90.	
aii	Critical angle is inversly proportional to refractive index	B1
b	30 °	
c	n=1 / sin c	M1
	n=1/sin 30 °	A 1
	n=2.0 [281]	AI
d	The angle incidence in the optically denser medium is greater than the	B1
	critical angle, TIR takes place.	
e	n=sin i/sin r	M1
	$r=\sin^{-1}(\sin 20 \circ /2.0) = 9.8^{\circ}$	A1
f	PQ will refracted, no TIR	B1
	As the ray travels from optically less dense medium to denser medium	B1