NANYANG GIRLS' HIGH SCHOOL

ANSWERS
Mid-Year Examination 2017
Secondary Three

PHYSICS

1 hour 30 minutes

Thursday **11 May 2017** **08:45 – 10:15**

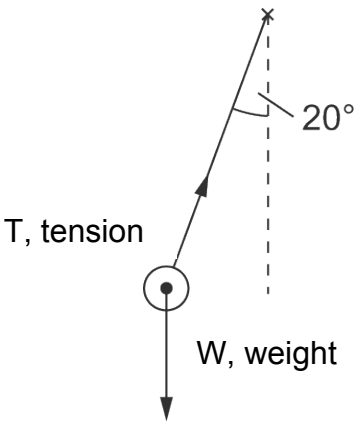
Calculators may be used

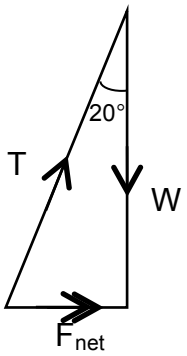
Section A

1	D	6	A	11	D	16	C
2	A	7	C	12	B	17	A
3	B	8	C	13	A	18	B
4	D	9	D	14	D	19	A
5	C	10	B	15	C	20	C

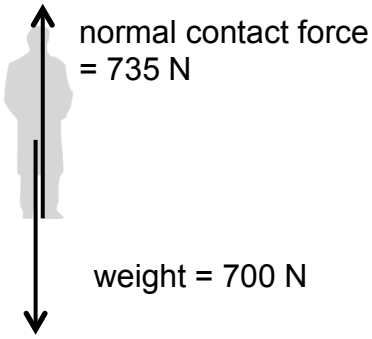
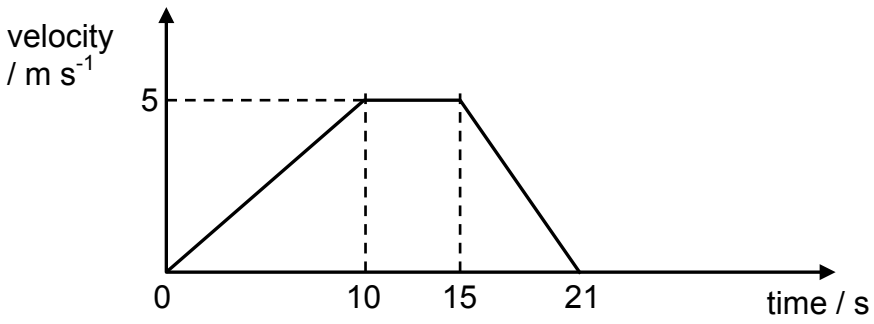
Section B

21	**(a)**		Measuring cylinder A; precision = 0.1 cm^3
	(b)	**(i)**	Cylinder B. Total volume of the 5 marbles exceeds to maximum capacity of cylinder A.
		(ii)	Possible Reasons: • Increases precision of average volume as the answer will have 3 s.f. (or 2 d.p.) compared to only 1 or 2 s.f. (or 1 d.p.) if measured directly from the measuring cylinders. • Increases precision as any random error in taking volume reading once will be divided by 5. • Variations in volume of individual marbles will be partially cancel each other to increase accuracy Mention of the following without elaboration is not accepted: • increase accuracy • reduce (random) errors • variations in the marbles • human judgement error (no such term as human error in this context) Following is not accepted: • *Reading from larger volume is more obvious* (the rise in level is smaller for the same volume change in a wider cylinder) • *The chance / possibility / likelihood of error is reduced* (this remains the same. It is the size of the error that is reduced) • *Parallax error* (not accepted as error, should be taken care of in expt) • Any general statements about precision, accuracy, errors etc without linking to the actual question.

22	**(a)**	100.0/2.00 = 50.0 cm s^{-1}
	(b)	Acceleration is constant. Correct calculation of velocity for 3 consecutive time intervals: first 0.40 s, vel = 10.0 / 0.40 = 25 cm s^{-1}; for second 0.40 s, vel = 15.0 / 0.40 = 37.5 cm s^{-1}; for third 0.40 s, vel = 20.0 / 0.40 = 50.0 cm s^{-1}; for fourth 0.40 s, vel = 25.0 / 0.40 = 67.5 cm s^{-1}; for fifth 0.40 s, vel = 30.0 / 0.40 = 75.0 cm s^{-1}. Calculate acceleration correctly e.g. (37.5 – 25) / 0.40 = 31.25 cm s^{-2} is constant.
23	**(a)**	Constant velocity till from 1 s to 9 s. Constant deceleration to zero from 9 s to 12 s. Reverse direction at 12 s / travels in opposite direction from 12 s. (Change direction, negative direction – not accepted) Constant acceleration from 12 s to 15 s.
	(b)	Positive displacement = area from 0 s to 12 s = ½ (12+9) x 28 = 294 m Negative displacement = area from 12 s to 15 s = 1/2 x 3 x 28 = 42 m Net displacement = 294 – 42 = 252 m
24	**(a)**	Ave velocity = 4.0 cm / (3 x 1/50) s = 66.7 cm s^{-1}
	(b)	Ave acc = (66.7 – 25) / (5 x 1/50) = 417 cm s^{-2} or 420 cm s^{-2}
25	**(a)**	W=mg = 75 x 1.6 = 120 N
	(b)	Same. This is the weight and it is a force.
26	**(a)**	ρ=m/V V=m/ρ =9.0/0.45 = 20 cm^3
	(b)	At the top if the liquid (must be shown partially out / partially submerged ~50%)
	(c)	Zero newtons
27	**(a)**	

	(b)	 F_{net} / W = tan 20° F_{net} = mg tan 20° = 0.60 x 10 tan 20° = 2.183 ≈ <u>2.2 N</u>
	(c)	F_{net} = ma ➔ a = F_{net} / m = 2.183 / 0.6 [1] = 3.640 ≈ <u>3.6 m s^{-2}</u> [1]

Section C

28	**(a) (i)**	v=u+at = 0 + (0.5x10) = 5.0 m s^{-1}
	(a) (ii)	F_{net} = ma =70 x 0.5 = 35 N
	(a) (iii)	N – W = ma N = ma + mg = 35 + 700 
	(b)	Constant velocity ➔ zero acceleration ➔ net force is zero (0 N)
	(c)	$v^2 = u^2 + 2as$ ➔ a = $(v^2 – u^2)/2s$ = $(0 – 5^2)$ / 2(15) = -0.833 m s^{-2} Consider freebody diagram of man+lift upwards & decelerating. T – W = ma, where m = 730+70 = 800 kg, W = mg = 8000 N T = mg + ma ➔ T = 8000 + 800(-0.833) = 7333 ≈ 7300 N
	(d)	 constant acceleration to 5 m/s over 10 seconds constant velocity from 10 s to 15 s constant deceleration from 15 s to 21 s v = u + at ➔ t = (v – u)/a = (0 – 5)/ (-0.833) = 6.0 s