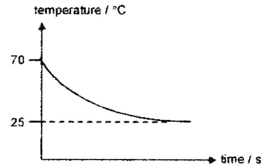
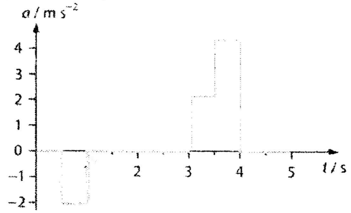
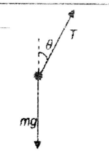
S.4 Physics Test Marking Scheme

Section A **Multiple Choices (35%)**

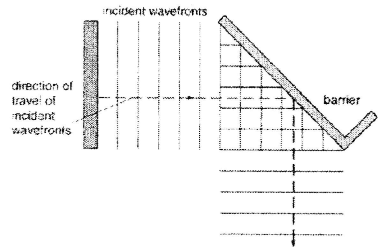
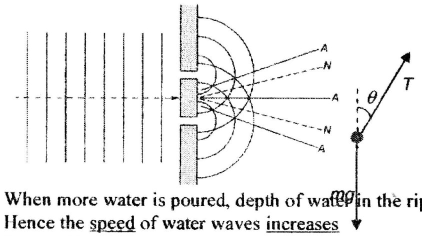
1	A	2	B	3	A	4	D	5	D	6	C	7	C	8	A	9	D	10	D
11	C	12	B	13	A	14	B	15	B	16	B	17	B	18	C	19	D	20	C
21	B	22	C	23	A	24	D	25	A	26	D								

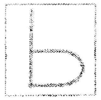
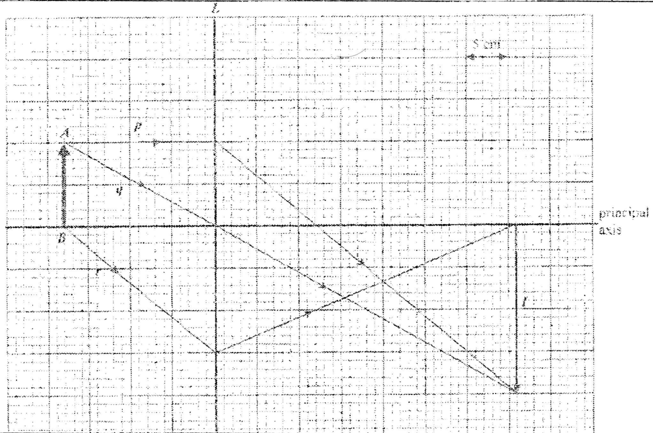
Section B **Conventional Questions (65%)**

Solution	Marks	Remarks
1 (a) Shiny surface is a poor emitter of radiation.	1A	
It helps reducing heat lost from the chafing dish to the surroundings.	1A	
(b) His suggestion is <u>not possible</u>	1A	
because heat should be transmitted from the upper tray to the food <u>by conduction</u>	1A	Plastic is an insulator of heat.
Plastic should not be used.		
(c) 	1A 1A 1A	Correcct shape of the graph Correct initial and final temperature Correct axes
2 (a) Ask your classmate to hold the ruler upright, with the 0 cm marks at the bottom. Place your fingers around the 0 cm mark.	1A	
Ask your classmate to release the ruler without warning. You need to catch the ruler as fast as possible with your fingers once it falls.	1A	
Find the height h fallen by the ruler.	1A	
Use the equation $h = ½ g t^2$ to find the reaction time t, in which g is the acceleration due to gravity.	1A	
(b) No.	1A	
The result would not be affected because all rulers fall at the same acceleration under gravity.	1A	
3 (a) The area under curve represents the displacement.	1M	
The displacement = −½ (2+3)(1) = −2.5 m. (left)	1A	
(b) (i) The rightmost position that the parcel reaches is −2.5 + ½ (2.5+5)(2) = 5 m	1M	For calculate the area from t = 3.5 s to 8.5 s
Therefore, the farthest distance from position P is 5 m.	1A	
(ii) When the parcel reaches position P, <u>the positive and negative areas are equal.</u>	1M	
The positive area is 2.5 m when t = 5 s, Therefore, the parcel reaches position P again at t = 5 s.	1A	
(c) (i) 	1A 1A	Any correct a for the interval t = 0.5 to 1 s, t = 3 to 3.5 s or t = 3.5 s to 4 s All correct (vertical line is optional)
(ii) From t = 3.5 s to 4 s,		
acceleration a = 2/0.5 = 4 m s^{-2}	1A	
Frictional force $f = ma$ = (10)(4) = 40 N	1A	
4 (a)		

Solution	Marks	Remarks
	1A 1A	Correct mg Correct T

Solution	Marks	Remarks
(b) $\cos\theta = \frac{mg}{T} = \frac{50\times9.81}{600}$	1M	
$\theta = 35.2°$	1A	
(c) (i) Centripetal force $F = T\sin\theta$	1M	
$F = 600 \times \sin 35.2° = 346$ N	1A	
(ii) $F = m\omega^2 r = m\left(\frac{2\pi}{T}\right)^2 r$	1M	Alt. method: Use $F = \frac{mv^2}{r}$ and $v = \frac{2\pi r}{T}$
$346 = 50\left(\frac{2\pi}{T}\right)^2 \times 5$		
Period T = 5.3 s	1A	Accept 5.34 s or 5.35 s

Solution	Marks	Remarks
5 (a) 	1A 1A	Constant wavelength Correct wavefront and direction of reflection
(b) (i) 	1A 1A	Correct circular waves At least 2 nodal lines N and 3 antinodal lines A are drawn.
(ii) When more water is poured, depth of water in the ripple tank increases.	1A	
Hence the <u>speed</u> of water waves <u>increases</u>		
By v = f λ, as frequency of water waves is a constant, <u>wavelength</u> of water waves <u>increases</u>.	1A	
Therefore, the <u>antinodal lines become farther away</u> from each other.	1A	Less antinodal lines produced
6. (a) (i) Convex (lens)	1A	
Only convex lens forms real image (which can be captured by a screen)	1A	
<u>Or</u> Concave lens always forms virtual image (which cannot be captured by a screen).	1A	
<u>Or</u> The image is formed on the other side of the lens.	1A	

Solution	Marks	Remarks
(ii) 	1A	
(b) (i) Image distance $v = 54 - 18 = 36$ cm ($D = 54$ cm)	1A	
Magnification $= \frac{v}{u} = \frac{36}{18} = 2$	1M / 1A	
(ii) Please refer to the ray diagram in next page	1M 1M 1M	Correct position of I Correct rays p and q Correct ray r
(iii) Focal length = 12 ±0.5 cm	1M/ 1A	
(iv) Move the lens 18 cm farther away from the object	1M	
Or move the lens 18 cm closer to / towards the screen	1M	
Height ratio = 1: 4	1A	
6 (b) (ii) 		
7 (a) (i) Constructive and destructive interferences take place alternatively along BC.	1A	
This results in alternative maximum and minimum reading being recorded along BC.	1A	
(ii) There is background noise.	1A	
Or As PX < QX, the intensity of the sound from P is larger than that from Q. They cannot completely cancel each other.	1A	
Or The loudspeaker is not a point sound source.	1A	
(b) The path difference at Z is QZ -PZ =6.32 – 5.30 = 1.02 m	1A	
Since Z corresponds to the third order maximum, the frequency f_o is $3\frac{v}{f_0} = 1.02$	1M	
$\frac{3 \times 340}{f_0} = 1.02$		
$f_o = 1000$ Hz	1A	

Solution	Marks	Remarks
(c) When sound of frequency f_0 reaches X, destructive interference occurs at X and the path difference is $\frac{\lambda_0}{2}$.	1M	
When the frequency is doubled to $2f_0$, the new wavelength is $\lambda = \lambda_0 / 2$, That means constructive interference occurs at X.	1M	
As a result, strong and weak sounds will be detected alternatively at X. Therefore, Jack is correct.	1A	
8 (a) Grating spacing $= \frac{0.01}{3000} = 3.33 \times 10^{-6}$ m	1A	
(b) The bright line at the 45 cm mark corresponds to the zeroth order bright fringe.	1A	
The bright lines at 9 cm and 81 cm marks correspond to the first order bright fringe	1A	
(c) For the 1st order fringe, $\sin\theta = \frac{0.45-0.09}{\sqrt{(0.45-0.09)^2+2^2}} = 0.1772$	1M	
By $d \sin\theta = n\lambda$,	1M	
wavelength $= \frac{d\sin\theta}{n} = \frac{3.33\times10^{-6}\times0.1772}{1} = 5.90\times10^{-7}$ m	1A	OR 590 nm
9 (a) From 20 Hz to 20 kHz	1A	
(b) It is the vibration of the diaphragm of the drum that gives out the sound	1A	
Since the vibrating frequency of the diaphragm falls within our audible range, we can hear the drum.	1A	

End of Marking Scheme