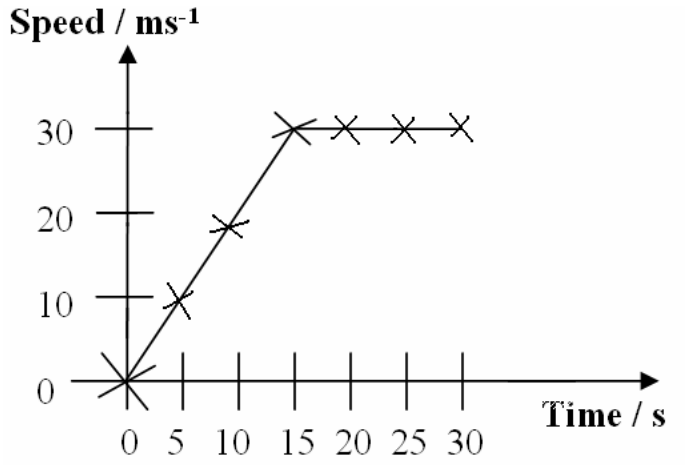
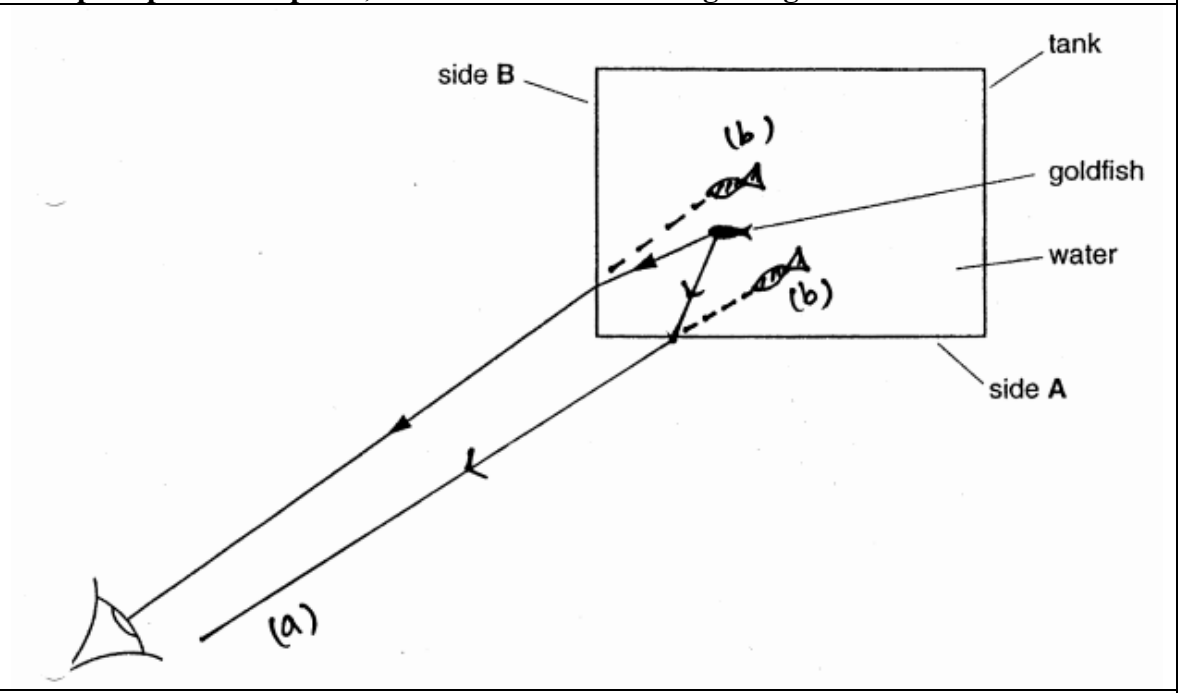
SEONDARY FIVE NORMAL ACADEMIC SCIENCE (PHYSICS) 5116
PRACTICE PAPER SET # 7
NOVEMBER 2007 GCE 'O' LEVEL SCIENCE PHYSICS PAPER
SUGGESTED ANSWERS

Question	Suggested Answer
1a	Plot the best line → is not a single collinear straight line Plotting points with a 'x' Drawing the best line through the points 
1b	Speed is increasing constantly at 10 m/s per second Uniform acceleration of 10 ms^{-2}
1c	Distance travelled = area under graph = (½)(15)(30) + (15)(30) m = 675 m ≈ 680 m **Note that to score this point, you should have the statement, and make use of your graph in 1a. Find the area under the graph that you have drawn.**
2a	Smallest upward force = smallest vertical force = weight Weight, W = m g W = m g = (500)(10) = 5000 N **Note that you can also write 5001 N but it is not recommended.**
2b(i)	$a = \frac{v - u}{t} = \frac{600 - 0}{3.0} = 200\ ms^{-2}$ **The initial speed is zero (at rest). The hint is that that in 2a, the rocket is about to take off.**
2b(ii)	F = m a F = (500)(200) = 100000 N **Make use of your answer to 2b(ii).**
3a	Gravitational potential energy (due to gaining of height) Kinetic energy (due to increases in speed) **The pump raises the water up, so the water gains gravitational potential energy.**

3b	GPE = m g h = (40)(10)(1.5) = 600 J **Note that we are given vertical height of 1.5 m, which is h.**
4	Pot B Firstly, pot B has a lower centre of gravity than pot A, and a lower centre of gravity makes it less likely to overturn. Secondly, pot B has a wider base than pot A, and having a wider base means it can be tilted more before it overturns. **Compare pot A and pot B, and make use of the diagram given.**
5a, 5b	
5a	Light bends away from normal when it travels from water to air. The question wants the light ray from the fish to the eye after refraction from side A.
5b	Our brain thinks that light from the image comes in a straight line to our eyes, so just draw a straight line light ray from the image to the eye.
6a	The number of complete ultrasound waves passing through a point per second.
6b	20 kHz **Human hearing: 20 Hz to 20 kHz** **Old people: 20 Hz to 15 kHz or less. As people grow old, they cannot hear the higher frequency sounds.**
6c	Ultrasound waves travel through the air in a series of compressions (air layers coming together) and rarefactions (air layers moving apart). The air particles in the air layers vibrate parallel to the direction of travel of the sound energy, and as they vibrate, they collide with neighbouring air particles to transfer the kinetic energy upon collision so that these neighbouring air particles in turn vibrate more. **Particle vibration and collision, together with compression and rarefaction, and finally explaining the concept of longitudinal.**

6d	$v = f\lambda$ $v = (250)(6.0) = 1500\ ms^{-1}$ **Speed of sound in air is about 300 m/s, and in water is about 1500 m/s**
7a	Can B has a darker and rougher surface compared to can A, and a darker, rougher surface is a better emitter of heat. Can B is made of a material that is a better conductor of heat than can A, so heat is conducted away faster. **Compare can A and can B. So your answer must mention the difference.**
7b	Lower. Can C has a smaller surface area (than can B) for heat to be emitted away, so it has a lower rate of heat radiation. **Compare can B and can C. Note that radiation depends on surface area, surface colour, and surface roughness.**
7c	Microwaves or Radiowaves **Ronald – Radio waves** **MacDonald – Microwaves** **Is – Infrared** **Very – Visible Light** **Ugly – Ultraviolet** **Xcept – X-rays** **Gary – Gamma rays**
8a	X is a lamp or a heated wire **As potential difference increases, the increase in current is smaller** **Hence, the resistance is higher (R = V / I)** **Only a lamp or a heated wire will have increasing resistance**
8b	When potential difference is 6.0 V, current is 0.15 A $R = \frac{V}{I} = \frac{6.0}{0.15} = 40\,\Omega$ **State clearly the current when p.d. = 6.0 V**
8c	When potential difference is 6.0 V, current is 0.15 A $Q = I\,t$ $Q = (0.15\ A)(1.0\ minute)$ $Q = (0.15)(1.0 \times 60) = 9.0\ C$ **State clearly the current when p.d. = 6.0 V**
9a	Current flows through the solenoid, and magnetises it such that the right hand side (facing the bar magnet) becomes a South-pole. Since unlike poles attract, the South-pole of the solenoid attracts the North-pole of the bar magnet over.

<table>
<tr><td>9b</td><td>The magnet is repelled, since like poles repel.

<u>Note that the right hand side (facing the bar magnet) becomes a North-pole now.</u></td></tr>
<tr><td>9c</td><td>The bar magnet will oscillate forward and backward because the right-hand side of the solenoid (facing the bar magnet) will be changing poles (from North-pole to South-pole) repeatedly. Over time, the bar magnet may become demagnetized.

Make use of your answer in 9a and 9b.</td></tr>
<tr><td>11c(ii)</td><td>The fuse will overheat, melt, and open the circuit so that no current will flow in the primary coil. The primary coil is now isolated from the battery supply.</td></tr>
<tr><td>12a</td><td>
<table>
<tr><th></th><th>Region X</th><th>Region Y</th><th>Region Z</th></tr>
<tr><td>Process</td><td>Heating a solid</td><td>Melting</td><td>Heating a liquid</td></tr>
<tr><td>State of matter</td><td>Solid</td><td>Solid and liquid mixture</td><td>Liquid</td></tr>
<tr><td>Temperature</td><td>Increasing from 20 ^{0}C to 70 ^{0}C</td><td>Constant at 70 ^{0}C</td><td>Increasing from 70 ^{0}C to 96 ^{0}C</td></tr>
</table>
Use a table to help you organize your answer.</td></tr>
<tr><td>12b(i)</td><td>Region Y: 7.5 min to 27.5 min
Duration of region Y = 27.5 – 7.5 = 20 min

P = W / t
W = P t = (50 W)(20 min) = (50)(20 x 60)
W = 60000 J</td></tr>
<tr><td>12b(ii)</td><td>Heat energy was lost to the surroundings as the surroundings were at a lower temperature.</td></tr>
<tr><td>12c</td><td>Textbook answer, give more than 3 differences.</td></tr>
</table>

NOVEMBER 2007 GCE 'O' LEVEL SCIENCE PHYSICS PAPER 1 (MCQ)
SUGGESTED ANSWERS

Question	Answer	Suggested Explanation
1	B	33 mm + 0.05 mm = 33.5 mm
2	D	Standard textbook definition. Acceleration depends on velocity.
3	D	The wheel is rotating anti-clockwise, so it is moving to the right at the road surface. Hence the frictional force opposes it and is forward.
4	C	Inertia depends on mass, and is the reluctance to change its motion.
5	D	Total energy at the start = KE + GPE $= \frac{1}{2} m v^2 + m g h$ $= \frac{1}{2} (0.6)(3)^2 + (0.6)(10)(2) = 2.7 + 12 = 14.7$ J Total energy at bottom = KE = 14.7 J
6	B	Cooled water contracts, becomes denser, and sink Heated water expands, becomes less dense, and rises
7	A	Does not expand uniformly → not linear
8	D	Gas → above its boiling point already Liquid → between its boiling point and melting point now
9	A	P is the amplitude (displacement) Q is one complete sine wave → Period (time)
10	A	$n = \frac{\sin(\text{bigger angle})}{\sin(\text{smaller angle})}$ $1.4 = \frac{\sin(45)}{\sin r}$ $r = \sin^{-1}\left(\frac{\sin 45}{1.4}\right) = 30.3^0$ **Change in degrees = 45 – 30.3 = 15**
11	C	Standard textbook answer. Radio-waves M I V U X Gamma
12	D	Like charges repel and unlike charges attract
13	C	Longer wire, larger resistance. So the current in circuit is reduced.
14	A	Total resistance is reduced due to adding in parallel. Hence, current in circuit (series current) will be larger. Since a larger series current passes through lamp Y, lamp Y is brighter.
15	D	The 2.0 Ω resistor and the 4.0 Ω have the same potential difference since they are connected in parallel. The 2.0 Ω has a higher current (easier for current to flow) than the 4.0 Ω. But A1 = A 2 + A3.
16	B	Earth wire is at 0 V. Neutral wire is also at 0 V. The fuse will blow only when there is a short-circuit, when the live wire touches the neutral wire and the live wire touches the earth wire. The person touching the live wire will get an electric shock, but the fuse may not blow if the person's hands are dry.
17	D	$V = \frac{W}{Q} \Rightarrow W = VQ = (12)(100) = 1200$ J
18	B	Out of syllabus
19	B	7 protons, and 14 – 7 = 7 neutrons
20	A	Out of syllabus.