**NOV 2004 GCE 'O' LEVEL PAPER 2**
**SUGGESTED ANSWERS**

| Question | Suggested Answer |
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| 1a | $S = \frac{D}{T} = \frac{100}{12.5} = 8.0\,ms^{-1}$ |
| 1b | Average speed implies constant speed throughout. At the start of the race, he is unable to run at 8.0 $ms^{-1}$ immediately upon taking off, so he must run faster at other parts of the race so that his average speed is 8.0 $ms^{-1}$ |
| 2a | Weight = W = m g<br>= (20 kg) (10 $Nkg^{-1}$) = 200 N |
| 2b(i) | Constant speed of the box means that the acceleration of the box is zero, and the resultant force of the box (F = m a) is zero as well.<br>The friction must be equal and opposite to the push of 80 N.<br>Friction = 80 N opposing motion |
| 2b(ii) | To the left opposing motion |
| 2c(i) | F = m a<br>F = (20 kg) (1.5 $ms^{-2}$) = 30 N = resultant force |
| 2c(ii) | Forward force – friction = resultant force<br>80 N – friction = 30 N<br>Friction = 80 N – 30 N = 50 N |
| 3a | Mass of alloy = mass of metal 1 + mass of metal 2<br>= $\rho_1 V_1 + \rho_2 V_2$<br>= (5)(4) + (6)(8)<br>= 68 g |
| 3b | Density of alloy = total mass ÷ total volume<br>= [68 g] / [4+ 8 $cm^3$] = 68 / 12<br>= 5.7 $gcm^{-3}$ |
| 4a | KE = ½ m $v^2$<br>KE = ½ (1400) $(20)^2$ = 280 000 J |
| 4b | Loss in kinetic energy = gain in work done to stop the car<br>280 000 = F s<br>280 000 = (F) (50 m)<br>F = 280 000 / 50 = 5600 N |
| 5a | Moved into strong sunlight → radiation heat transfer<br>The process is radiation heat transfer |
| 5b | Can A. Can A has a higher rate of heat gain (gains heat faster) so its temperature increases faster, because black surfaces are better absorbers of heat radiation than polished surfaces. |
| 6a | Draw the normal axis (dotted line)<br>Draw the refracted ray that bends towards the normal<br>Mark out the angle of incidence and angle of refraction |
| 6b | $n = \frac{\sin(\text{bigger angle})}{\sin(\text{smaller angle})} = \frac{\sin 45}{\sin 28} = 1.51 \approx 1.5$ |

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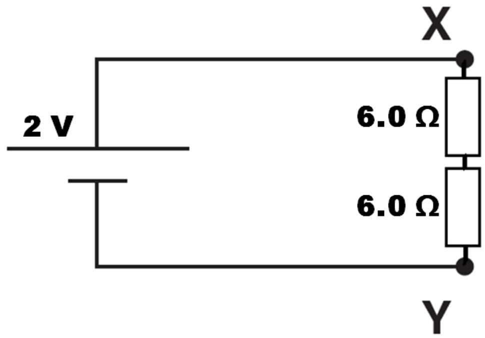
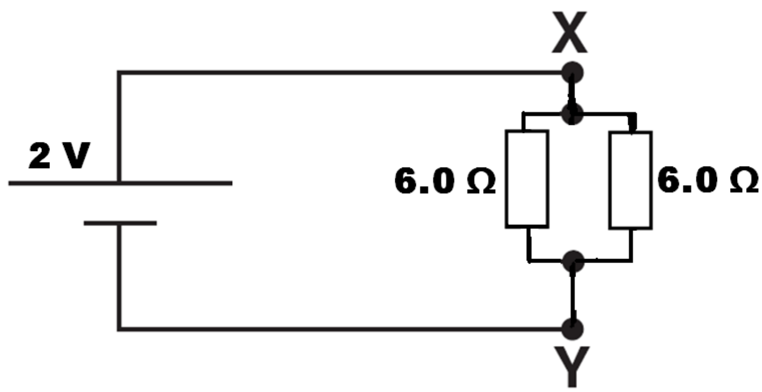
| 6c | $n = \frac{c}{v} = \frac{\text{speed of light in air}}{\text{speed of light in glass}}$<br>$v = \frac{c}{n} = \frac{3 \times 10^8}{1.5} = 2.0 \times 10^8 \text{ ms}^{-1}$ |
| 7a(i) | <br>Label all values of all components<br>Series connection<br>Correct symbol for resistor |
| 7a(ii) | Total resistance = 6.0 Ω + 6.0 Ω = 12.0 Ω |
| 7b(i) |  |
| 7b(ii) | $\frac{1}{R} = \frac{1}{6.0} + \frac{1}{6.0} = \frac{2}{6.0}$<br>$R = \frac{6.0}{2} = 3.0\Omega$ |
| 7b(iii) | Current in each resistor = I = V / R<br>= 2.0 V / 6.0 Ω = 0.33 A |
| 8a | Earth wire is connected to the ground (0 V) |
| 8b | The fuse rating would be slightly higher than the expected current in the appliance. |
| 8c | When there is excessive current in the circuit, the fuse would overheat and melt, isolating the appliance from the power supply so that the live wire would not charge the appliance at a high potential. |
| 10a(i) | A larger volume of mercury in a bigger bulb would expand more than a smaller volume for a given rise in temperature.<br>This would produce a greater movement of the liquid in the thermometer stem. |
| 10a(ii) | The conduction of heat to the liquid inside the bulb is faster through a thinner glass wall, and the liquid inside a thinner glass wall can hence react faster to changes in temperature. |

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| 10b | The thermometric properties of the liquid in the thermometer:<br>(a) the volume of a fixed mass of liquid,<br>(b) and that the volume of this fixed mass of liquid expands and contracts linearly with a unit change in temperature |
| 10c(i) | Resistance of a metal wire<br>Volume of a fixed mass of gas<br>Electric current in a metal wire |
| 10c(ii) | **Step 1:** place the thermometer in a filter funnel of pure melting ice at 0 $^oC$ at a pressure of 1 atm, and then mark out the level of mercury as 0 $^oC$<br><br>**Step 2:** place the thermometer in the steam above pure boiling water at 100 $^oC$ at a pressure of 1 atm, and then mark out the level of mercury as 100 $^oC$<br><br>**Step 3:** divide the length between the 0 $^oC$ marking and the 100 $^oC$ marking into 100 equal divisions, each division representing 1 $^oC$. |
| 11a(i) | Interchanging the position of the firer and the timer so as to perform the experiment again, and then taking the average of the two results (in 2 different positions) obtained. |
| 11a(ii) | Increase the distance between the firer and the timer so that the time readings are large, so as to minimize the percentage error due to human reaction time.<br>Also, perform the experiment a few more times and take the average time. |
| 11a(iii) | Increase the distance between the firer and the timer so that the time readings are large, so as to minimize the percentage error due to human reaction time. |
| 11b | 20 Hz to 20 000 Hz |
| 11c | As the ripples move from left to right, the water molecules at the water surface vibrate up and down, perpendicular to the direction of travel of the ripples.<br>Energy is transferred on the water surface. |
| 12a(i) | As current flow in the solenoid, it creates a magnetic field in the solenoid.<br>The magnetic field magnetises rod A and rod B to have the same pole at the same ends. Since like poles repel,rod A and B roll away from each other. |
| 12a(ii) | When switch S is opened, the iron rod loses its magnetism while the steel rod retains its magnetism. The steel rod induces the iron rod to become a temporary magnet, and hence both rods attract. |
| 12b | Alternating current in the solenoid creates an alternating magnetic field that magnetises the rods to have the same pole at the same end. The rods were not removed from the solenoid, so they were not demagnetized. Hence, they will still repel each other as like poles repel. |
| 12c | The rods should be inserted into the solenoid in turn. The steel rod would deflect the galvanometer needle briefly as it is still magnetized, while the iron rod would not deflect the galvanometer needle because it has lost its magnetism. |

**NOV 2004 GCE 'O' LEVEL PAPER 1**
**SUGGESTED ANSWERS**

| Q | ANS | Suggested Explanation |
|---|---|---|
| 1 | C | Distance travelled = area under speed-time graph<br>= ½ (10)(20) + (10)(20) = 300 m |
| 2 | C | W = m g<br>g = W ÷ m [largest ratio of W/m = largest g] |
| 3 | A | Moment = F d = (40 N)(20 cm) = 800 N cm anti-clockwise<br>To balance, we need 800 N cm clockwise about the pivot<br>Hence, M = F d = (20 N)(40 cm) = 800 N cm clockwise [Option A] |
| 4 | A | Heat energy (most of it) and sound energy (some of it) |
| 5 | D | By conservation of energy, total energy at X = total energy at Y<br>Since car is not moving (at rest) at X, energy at X = G.P.E only<br>Car is still moving at Y, so energy at Y = KE + GPE |
| 6 | D | Evaporation occurs at the surface of liquid at all temperatures |
| 7 | B | Convection is the main process in liquids and gases. |
| 8 | C | Frequency is the number of complete waves passing through per second |
| 9 | D | Images can be real and inverted, or virtual and upright. |
| 10 | D | Electromagnetic waves travel through vacuum at a speed of $3.0 \times 10^8$ m/s |
| 11 | B | Speed of sound is faster in solids and slowest in gas. |
| 12 | A | Bar needs to be attracted, so it must be a magnetic material (iron nickel cobalt). |
| 13 | D | Ammeter connected in series, and voltmeter connected in parallel across. |
| 14 | D | Q = I t = (P/V) (2.0 s)<br>= (48 / 12 ) (2.0) = 8.0 C |
| 15 | A | Resistance changes, the effective resistance in the circuit changes, so the series current in the circuit changes |
| 16 | B | Live wire is connected to the earth wire and both are connected to the fuse. So the metal case (which is connected to the earth wire) is now connected to the live wire. |
| 17 | C | P = I V = (5 A)(250 V) = 1250 W<br>Since the maximum is 1250 W, we choose an answer that is smaller than 1250 W but closest to it. |
| 18 | B | Out of syllabus |
| 19 | C | Out of syllabus |
| 20 | A | 8 protons and 17 – 8 = 9 neutrons |