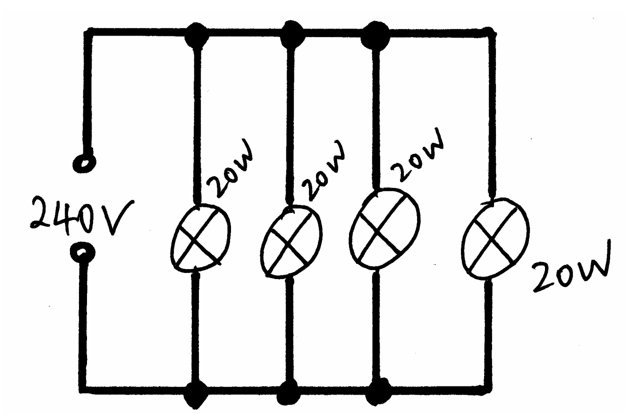
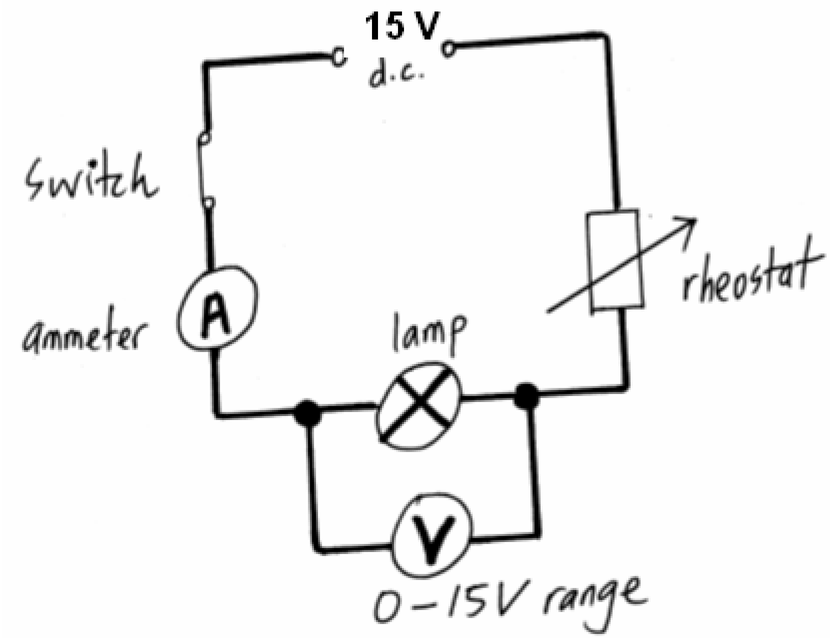
SEONDARY FIVE NORMAL ACADEMIC SCIENCE (PHYSICS) 5116
PRACTICE PAPER SET # 6 NOV 2005 GCE 'O' LEVEL PAPER 2
SUGGESTED ANSWERS

Question	**Suggested Answer**
1a	Between time = 70 s and time = 74 s Note that there is a difference between constant acceleration and zero acceleration. Zero acceleration means the speed is constant. Constant acceleration means, to Cambridge, that the speed is changing.
1b	Time = 70 s When the parachute is opened, the speed immediately decreases drastically
1c	The downward acting weight of the man is equal to the upward acting drag (air resistance) on the man. Hence, the resultant on him is zero, and since F = m a, his acceleration is zero. For zero acceleration, it means that his speed is constant.
2	**Step 1** Pour 50.0 cm^3 of water into a dry measuring cylinder. Tie the ring with a string, and slowly lower the ring into the 50.0 cm^3 of water until it is fully submerged. Determine the increase in volume. The increase in volume is the volume of the ring. **Step 2** Using an electronic mass balance, measure the mass of the ring. **Step 3** Determine the density of the ring, where density = mass ÷ volume **Step 4** If the density of the ring is equal to the density of pure gold, then the ring is made of gold. Draw labelled diagrams where possible.
3a	Gamma x-rays **ultraviolet radiation** light infra-red microwaves **radio waves**
3b	The number of complete waves passing through in one second
3c	3.0×10^8 ms^{-1}
3d	They are transverse waves They can travel through a vacuum They obey the laws of reflection and refraction They carry no electrical charge
4	Taking moments about the pivot, for equilibrium, $M_{ACW} = M_{CW}$ (F)(4.0 cm) = (5.0 N)(16 cm) F = (5.0 x 16) / 4.0 = 20 N F = 20 N
5a	Electrical energy → kinetic energy + heat energy + sound energy
5b(i)	GPE = m g h = (0.1)(10)(0.5) = 0.50 J

Question	Suggested Answer
5b(ii)	P = W / t = 0.50 / 1 [1 second] = 0.50 W
5c	It was converted to heat and sound energy, and was dissipated (lost) to the surroundings.
6a	
6b	The image is upright, virtual, and magnified. It is used in a magnifying glass.
7a	P = I V [remember poison ivy] I = P / V I = 20 / 240 = 0.083 A
7b	Cost = kW x hours x unit cost $= \frac{20}{1000} \times 200 \times 20$ $= 80$ cents
7c(i)	Number = 100 W / 20 W = 5
7c(ii)	Supply of 240 V Lamps are directly connected in parallel to the supply of 240 V Label of the supply of 240 V Label of lamps of 20 W 
8a	Sound B has a higher maximum pressure than A, so its amplitude is higher, and is louder than B. Sound B has a smaller Period than A, so its frequency is higher than B, and hence the pitch of B is higher than that of A. Note: look for one complete sine curve for both A and B
13a	When current flows in the solenoid, it creates a magnetic field in the solenoid. This solenoid magnetic field magnetizes both iron rods to have the same pole at the same end, and since like poles repel, the two iron rods repel.
13b	The two rods will stay at where they are. Copper is not a magnetic material, and hence cannot be magnetized into a magnet. The magnetized iron rod will not attract, nor repel, the copper rod.

Question	Suggested Answer
14a(i)	 Range of voltmeter used: 0 – 15 V
14a(ii)	As the potential difference increases, the increase in current decreases. Since R = V / I, Resistance of the lamp increases. As potential difference increases, the resistance of the lamp increases.
14b(i)	**1.** Using the graph, when current in L is 0.8 A, the p.d. of L is 3.0 V **2.** When current in L is 0.8 A, current in W is also 0.8 A (series connection) **3.** Using the graph, when current in W is 0.8 A, the p.d. of W is 12.0 V p.d. of the supply = p.d. of L + p.d. of W = 3.0 V + 12.0 V = 15.0 V **4.** Resistance of L = V / I = 3.0 / 0.8 = 3.75 Ω ≈ 3.8 Ω
16a(i)	A fuse prevents overheating and fire. A fuse is included in the live wire to prevent excessive current flow that will damage the heating element. It will overheat, melt, open the circuit and cut off the current in the circuit when there is excessive current flow. When the fuse blows, there is an open circuit and current can no longer flow, shutting down the heating element to prevent it from overheating.
16(ii)	When there is a leakage in current from the heating element, the earth connection will provide a low resistance path for the large current to flow. This large current will cause the fuse to overheat and melt, open the circuit to cut off the current.
16b(i)	Energy = Power x Time E = P t E = (6000 W)(6 min) E = (6000 W)(6 x 60 s) = 216000 J ≈ 220000 J

Question	Suggested Answer
16b(ii)	E = kW x hour $E = \frac{2000}{1000} \times 0.1 = 0.20\ \mathrm{kWh}$
16b(iii)	Cost = kWh x per unit \$ = 0.20 x 8 = 1.6 cents
16c	Liquid water changes into water vapour (gas) when evaporation occurs. The highly energetic water molecules near to the water surface gains enough energy from its surroundings to leave the surface. The lower energy water molecules remaining, after losing energy, have a lower average kinetic energy, and a lower temperature. This results in cooling.
15a(i)	Higher amplitude.
15a(ii)	Louder sound → higher amplitude, since amplitude is proportional to the loudness. Higher pitch → higher frequency → more complete sound waves per unit time → smaller Period of sound wave
15b	Electrical energy from the mains is converted to chemical potential energy in the battery. Some of the electrical energy from the mains is also converted to thermal energy in the battery.
12b(i)	As the water near the heating element gets heated up, they expand in volume (water molecules move farther apart), become less dense, and floats up to the top. Cooler surrounding water that is denser will sink down to be heated. This convection cycle of hotter less dense water floating and cooler denser water sinking continues. As the water molecules near the heating element gets heated up, they gain kinetic energy, move faster and more vigorously, collide with their neighbouring molecules, and transfer the kinetic upon collision. The transfer of energy through particle collision conducts heat through the water.
12b(ii)	When the surface becomes dirty, the darker surface colour and rougher surface texture makes it a better emitter of thermal energy compared to a shiny smooth surface, and hence loses energy more quickly.

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SUGGESTED ANSWERS

Question	Answer	Suggested Explanation
1	B	2.5 mm + 0.23 mm = 2.73 mm
2	D	Constant distance = not moving = stationary = zero speed = at rest At X: increasing speed → accelerating (acceleration more than zero) At Y: Same speed → zero acceleration
3	B	Resultant force = m a 30 – 10 = (20 kg)(a) 20 = 20 a a = 20 / 20 = 1.0 ms^{-2}
4	D	Lower C.G. and wider base → increase stability → more stable
5	C	KE = ½ m v^2 1800 = ½ (m) $(30)^2$ m = (1800 x 2) / 900 = 4.0 kg
6	A	Black surface is a better emitter and a better absorber than a white surface
7	B	By proportion, 10 cm → 100 ^oC difference (6.6 – 1) = 5.6 cm → 100 / 10 x 5.6 = 56 ^oC
8	C	Look for one complete sine wave (or cosine wave)
9	A	v = f λ 5 = f (10) f = 5 / 10 = 0.50 Hz
10	D	Angle of incidence is measured from the normal line Hence, angle of incidence = 90 – 40 = 50 ^{o} = angle of reflection
11	B	Normal hearing for young people: 20 Hz to 20 kHz Normal hearing for old people: 20 Hz to around 15 kHz
12	B	Q = I t I = Q / t = 60 / 20 = 3.0 A
13	C	Switch 1 alone → no lamp is on Switch 2 alone → no lamp is on Switch 3 alone → no lamp is on Switch 1 and 2 → on 1 lamp Switch 2 and 3 → on 3 lamps Switch 1 and 3 → on 2 lamps
14	D	V1 = IR = 1.0 (4) = 4.0 V V2 = IR = 0.5 (4) = 2.0 V [splitting of current into two]
15	A	Total cost = (3 x 2)(5.0 cents) + (2 x 4)(5.0 cents) = 30 cents + 40 cents = 70 cents
16	D	Demagnetisation require pulling out magnet from an solenoid with an a.c. supply
17	C	Out of syllabus
18	D	Out of syllabus
19	A	88 protons (proton number is the lower number)
20	D	Out of syllabus (beta particle is an electron) ${}^{0}_{-1}e$