IGCSE PHYSICS 4420, NOVEMBER 2005 MARK SCHEME

Paper 2H

Question 1

(a)	longitudinal		**1**
(b)	use and recall v = f x λ		**1**
	384 x 0.86 = 330 (m/s)		**1**
(c) (i)	no		**1**
(c) (ii)	not within (audible) range of 20 – 20 000 Hz	frequency too high	**1**

Total 5 marks

Question 2

(a)	insulator	zero if both boxes ticked for one row	**1**
	insulator		**1**
(b)	1 mark each for **any two** • (electrons) move from the cloth • to the rod • electrons are negative(ly charged)	**Maximum**	**2**
(c) (i)	to the rod / right		**1**
(c) (ii)	positive /similar charges repel **or** opposite / unlike charges attract		**1**

Total 6 marks

Question 3

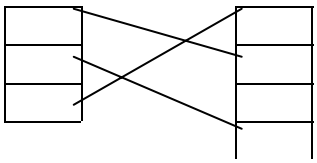
(a)	five correctly plotted points	± half a small square -1 for each misplot or missing plot to a maximum of 2	**2**
	best straight line	through 0,0 and at least one point on either side of the line	**1**

(b)	2.9 (cm)	2.8 – 3.0 cm read from graph ± half small square	**1**
(c)	not linear relationship for large loads OWTTE	beyond elastic limit	**1**
(d) (i)	(helical)spring	allow (metal) wire	**1**
(d) (ii)	straight region indicates wire or spring (1) curved line would be seen for rubber band (1) extension too great for wire (1) *not allowed if answered wire in(i)*	any other reason why it might be spring/wire any reason why it isn't rubber band reason why it isn't wire	**Maximum 2**

Total 8 marks

Question 4

(a)



3

(b) (i)	none/zero	**1**
(b) (ii)	particle moving parallel to the field(lines)	**1**

Total 5 marks

Question 5

(a)	light to		**1**
	electrical		**1**
(b) (i)	6000 / 120 = 50(W)	6000 / 2 = 3000 scores 1	**1** **1**
(b) (ii)	1 mark each for **any two** rays change angle of incidence at roof (1) clouds/weather conditions (1) no sun at night (1)		**Maximum 2**

Total 6 marks

Question 6

(a)	reflection		**1**
(b)	draw reflected ray	angles of incidence and reflection equal by eye	**1**
	draw second ray from cat tail reflected in mirror	ditto	**1**
	drawn reflected rays converge at C		**1**

Total 4 marks

Question 7

(a) 1	a.c.	not 'cell is d.c.'	**1**
(a) 2	larger voltage		**1**
(b)	lamps in parallel with cell		**1**
	each lamp can be switched off/on independently		**1**

Total 4 marks

Question 8

(a) (i)	correct substitution once into $density = \frac{mass}{volume}$		**1**
	copper 9 000 iron 8 000		**1**
(a) (ii)	iron		**1**
(a) (iii)	copper		**1**
(b)	measure length, (breadth, width)	OWTTE	**1**
	with a rule		**1**
	multiply together or cube it		**1**

Total 7 marks

Question 9

(a) (i)	Y … X … Z	all correct in correct order	**1**
(a) (ii)	direction(s) shown	or (represented by) arrows	**1**
(a) (iii)	(U=) X + Z - Y	or any order of +X, +Z and -Y	**1**
(b)	either 0.750 (3) m/s^2 east (1)	both unit and direction required for the 4th mark	
	or force = mass x acceleration (1) acceleration = force ÷ mass(1)	or 1125 = 1500 x acceleration or acceleration = 1125 ÷ 1500	**4**

Total 7 marks

Question 10

(a)	electrical	allow 'electricity'	**1**
(b) (i)	reduce frequency	allow 'lower/drop' frequency or increase wavelength	**1**
(b) (ii)	increase amplitude	allow 'raise' amplitude	**1**
(c) (i)	diffraction	allow 'diffracted'	**1**
(c) (ii)	…(the width of the) gap…		**1**
(d)	measure distance (1) start to measure time when sound generated (1) one correct mention of appropriate measuring instrument i.e. metre rule/tape, stop watch/clock and no inappropriate mention (1) indication that speed = distance ÷ time (1)	if 'echo method' must be clear that this is the distance there and back if 'observer method' must be clear how observer knows the moment sound generated points may be credited either from written response or from diagram but do not credit the point if writing and diagram contradict	**4**

Total 9 marks

Question 11

(a)	either 6.75 (W) (2) or power = current x voltage (1)	or power = 1.5 x 4.5	**2**
(b)	either 4050 (J) (2) or clear indication that time is 10 x 60 / = 600 (s) (1)		**2**

(c) flow/movement of electrons (1)

from negative (end/side) to positive (end/side) (1) **2**

(d) any two, (1) each

- collisions between electrons and ions/atoms/nuclei/other particles — do not credit 'molecules'
- transfer of energy
- (large) rise in temperature — or gets (much) hotter
- light /infra-red (radiation) given out **2**

Total 8 marks

Question 12

(a) either 50(.00) (3) (m/s) (1)

or KE = ½ mv^2 (1)

v^2 = 2 x KE ÷ m (1)

or KE = ½ x 3.5(00) x v^2
or v^2 = 2 x 4375 ÷ 3.5(00)
or v^2 = 4375 ÷ 1.75(0)
or v^2 = 2500
or v = √2500 **4**

(b) **either** — **treat parts (b)(i) and (b)(ii) together** **2**

(b)(i) 4375 (J) (1)

(b)(ii) any one of (1)

- conservation of energy applies — allow 'no air (resistance)' 'no friction' 'no wind'
- air resistance/friction negligible
- stone does not hit anything (on the way down)
- (energy transfer) 100 % efficient
- no energy transferred (as it fell) as heat/sound — do not credit 'no energy transferred when it landed'
- zero gravitational/potential energy at ground level

or

(b) (i) more than 4375 (J) (1)

(b) (ii) any one of (1)

- (some) energy used to overcome friction/air resistance
- energy transfer is less than 100 % efficient
- (some) energy transferred (as it fell) as heat/sound
- some gravitational/potential energy at ground level

do not credit 'some energy transferred when it landed'

Total 6 marks

Question 13

(a) appropriate statement (1)

appropriate amplification/ comment/ explanation (1)

examples of advantage

no fuel is burned so no atmospheric pollution

nothing has to be transported to the site nor any waste disposed of

coal/oil/gas is not burned so does not increase the 'greenhouse' effect
do not credit '… cause the greenhouse effect ' for this 2nd mark **2**

(b) appropriate statement (1)

appropriate amplification/ comment/ explanation (1)

examples of disadvantage

wind not always strong enough /at appropriate strength so no electricity generated

wind (strength) may not match demand for electricity

visual/sound pollution so loss of (scenic) value/tourist potential

manufacture of the material to make the turbines results in pollution **2**

Total 4 marks

Question 14

(a) (i) any two, (1) each

- fixed mass
- temperature constant
- (remains an) ideal gas

2

(a) (ii) either 0.58 (m^3) (2) or 0.576 (m^3)

or (volume =)
120 x 1.2 ÷ 250 (1)

2

(b) (i) 0/zero (K) **1**

(b) (ii) the particles are not moving or lowest possible temperature or it is absolute zero **1**

(c) any three, (1) each

- heat conducted through the cylinder
- (average/kelvin) temperature of the gas/particles increases
- (average) speed of the particles increases
- more (energetic) collisions with the (inside of) the cylinder
- pressure increases

3

Total 9 marks

Question 15

(a) (i) step-up transformer(s) used after generation/at start of transmission (1)

step-down transformer used after transmission/during distribution (1)

Either allow 'some increase and some decrease the voltage/current' for (1) mark only

or allow '(transformers used) at beginning and end' for (1) mark only

2

(a) (ii) to increase voltage for transmission (1)

(so) energy losses are less/system more efficient/less energy lost as heat/transmission current is small (1)

to decrease voltage to safe(r) value for use in homes etc.

points may be credited in either (a)(i) or (a)(ii)

or high voltage not appropriate for domestic equipment (1)

3

(b) either 15 (mA) (3)

or $V_p I_p = V_s I_s$ (1)

$I_p = V_s I_s \div V_p$ (1)

or $230 \times I_p (\div 1000) = 6 \times 575 (\div 1000)$

or $I_p (\div 1000) = 6 \times 575 (\div 1000) \div 230$ **3**

Total 8 marks

Question 16

(a) to ensure that the current flows through all of the coil

or to prevent a short circuit
do not credit references to electric shock or to heat insulation **1**

(b) (i) to the right/inwards

allow 'towards the magnet'
do not credit 'away from the cone' **1**

(b) (ii) any two, (1) each

- (use a) more powerful/stronger (permanent) magnet
- have more turns on the coil

allow 'have more coils on the coil'
do not credit 'have a bigger coil'

- larger current

allow 'larger voltage' **2**

(c) (i) 3.6 (kHz) **1**

(c) (ii) kilohertz

allow 'kiloHertz'
allow 'phonetic' spellings **1**

Total 6 marks

Question 17

(a) Isotopes (1)

protons … neutrons (1)

both in the correct order **2**

(b) (i) alpha/α **1**

(b) (ii) helium nucleus/ ^4_2He is an alpha/α particle **1**

(c) (i) neutron/n **1**

(c) (ii) fission

accept minor misspelling but not if it could be read as 'fusion' **1**

(c) (iii) nuclei (1)

accept 'nucleuses'

neutrons (1)

kinetic (1)

accept 'movement' **3**

(c) (iv) neutrons (given out) hit other nuclei (uranium-235) (1)

Either must be a critical/sufficient mass (of uranium-235) (1)
or
which (in turn) release more (1) neutrons and so on

this mark should only be awarded if the notion is conveyed that the process continues **2**

Total 11 marks

Question 18

(a) horizontal line from the maximum to the y-axis

must be clear that terminal velocity is intercept on the y-axis **1**

(b) any six points, (1) each

- (object is) pulled down(wards) by (force of) gravity
- at the start the acceleration (downwards) is greatest
- so the slope (of the graph) is steep(est)
- the faster it falls the greater the (force of) friction/air resistance (becomes)
- so unbalanced/resultant force becomes less
- so the acceleration becomes less and the slope becomes gentler
- levels off when the unbalanced/resultant force becomes zero

both parts are now required for this mark

or levels off when friction/air resistance (upwards) = gravity/weight (downwards) **6**

Total 7 marks

Total for paper 120 marks