

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**Cambridge Ordinary Level**

## **MARK SCHEME for the May/June 2015 series**

### **5054 PHYSICS**

**5054/22**

Paper 2 (Theory), maximum raw mark 75

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- 1 (a) weight (pulls spring down and causes tension)  
or force/pull of **gravity**  
or mass is in gravitational field B1
- (b) has a direction B1
- (c) (i) 1  $l = l_0 + e$  or  $l_0 = l - e$  or  $e = l - l_0$  B1  
2 36 cm B1  
(ii) curve upwards after 10 N B1
- 2 (a) tape B1
- (b) (i) mass  $\div$  volume or mass per unit volume B1  
(ii) (V=)  $15 \times 0.25 \times 2$  or 7.5 seen C1  
2400 kg/m<sup>3</sup> A1  
(iii) (A=)  $15 \times 0.25$  or 3.75 or (P=)  $F/A$  C1  
or (P=)  $18\,000/A$  or (P=)  $dgh / \rho gh$  seen A1  
48 000 Pa  
(iv) (length doubles) so both area **and** weight/force double B1  
or area **and** force/weight both increase/larger (in proportion)  
or height **and** density the same (in  $P = dgh$ )
- 3 (a) (i) (efficiency =) useful energy  $\div$  input energy C1  
or  $95\,000/120\,000 (\times 100)$   
0.79(17) or 79(.17)% A1  
(ii) (P=) energy/time or  $90\,000/60$  C1  
1500 W A1
- (b) electric kettle **and** B1
- **more** energy/heat **per minute** output/into water/supplied
  - more power output
- transfers heat/energy faster/at a faster rate
- (c) steam molecules have more potential energy; further apart; smaller force/bonds  
between molecules; have latent heat; more random arrangement B1
- 4 (a) (H=)  $mcT$  or  $330 \times 4.2 \times 13$  C1  
18 000 J or 18 020 J or 18 018 J A1

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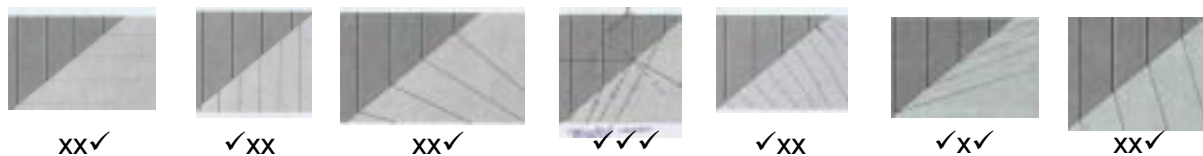
	(b) ice takes in/ needs heat/ energy	B1
	<ul style="list-style-type: none"> <li>• for latent heat</li> <li>• to melt/ turn to water (at 0 °C)/ change state</li> <li>• to break bonds/ for molecules to gain P.E.</li> </ul>	
	water (in jug initially at 0 °C) warms up	B1
	or ice (and melted water in jug)	
	<ul style="list-style-type: none"> <li>• stays at 0 °C/ stays cold/ stays at constant temp.</li> <li>• gives larger temperature difference (between liquid and melting ice in jug)</li> </ul>	
	(c) metal is a good conductor (of heat)	B1
	or metal/ can has lower heat capacity	
	allow opposite statements for plastic, e.g. plastic is an insulator (of heat),	
	penalise wrong statements and Physics, e.g. liquid evaporates from can, metals	
	conduct temperature/ convect better	
5	(a) negative charge moves from hair/ person/ head to balloon	C1
	electrons move from hair/ person/ head to the balloon	A1
	(b) hair is positive (at end)	B1
	opposite charges attract	B1
	or positive and negative attract	
	(c) charges/ electrons	B1
	<ul style="list-style-type: none"> <li>• don't flow away</li> <li>• aren't conducted (to earth/ person)</li> </ul>	
	stay on balloon/ on insulator	
	(d) any sensible example e.g. photocopier, electrostatic precipitator, flu ash removal,	
	spray painting, printing, crop spraying, lightning fixes nitrogen in atmosphere etc.	B1
6	(a) (i) mention of (magnetic) field/ flux (of N and S-poles)	C1
	(coil/wire) cuts magnetic field/ flux/ lines	A1
	or magnetic flux in coil changes	
	(ii) (one side of) coil cuts one way and then the other	B1
	or (side) moves one way and then the other/ returns	
	or flux increases and then decreases	
	(b) increase in emf for both stronger magnets and more turns	B1
	no change/ same frequency for both stronger magnets and more turns	B1
	increase and increase for turn the coil faster	B1

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- 7 (a) to provide a complete circuit (with live)  
**or** to pass current back to mains  
**or** provide a return path for the current B1
- (b) current/charge/electrons flow to earth/earth wire/ground (when live touches case)  
 fuse melts/blows **and** disconnects circuit/cuts live/stops current B1  
 B1
- (c) doubly insulated B1  
**or case/body** made of plastic/insulator/not made of metal  
**or** user cannot touch metal
- (d) (circuit breaker) B1
  - turns off/acts fast(er)
  - can be reset
  - easy to see it has tripped/switched
  - can detect small difference between live and neutral currents / small (leakage) current to earth
- 8 (a) left column both 1 B1  
 right column 0 **and** 1 B1
- (b) (at least one of the atoms) contain same number of electrons and protons B1  
**or have** 1 electron and 1 proton  
 charge on electron and proton opposite B1  
**or** electron negative **and** proton positive  
**or** charge on electron neutralises/cancels/balances proton charge  
 neutrons have no charge B1
- 9 (a) number of waves (that pass a point) M1  
**or** number of oscillations (passing a point)  
 in unit time **or** per second **or** in 1 second A1
- (b) (i) 1.5 cm B1
- (ii)  $(v = )f\lambda$  **or**  $5 \times 1.5$  seen C1  
**or**  $(s=)d/t$  **and**  $f = 1/t$   
 7.5 cm/s A1
- (c) (i) wavelength decreases B1  
 travels a shorter distance in the same time B1  
**or** frequency stays the same (and  $v = f\lambda$ )

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- (ii) wavefronts with smaller wavelength (by eye) B1  
 smaller angle to surface (by eye) **and** slanted down B1  
 wavefronts join those in shallow water B1



(d) (i)

sound	water	
particles/wave/source <ul style="list-style-type: none"> <li>vibrate/oscillate/move in direction of (travel of) wave/along wave</li> <li>move backwards and forwards</li> </ul>	particles/wave/source <ul style="list-style-type: none"> <li>vibrate/oscillate/move at 90° to direction of (travel of) wave</li> <li>move up and down</li> </ul>	B1 B1 one row only
(contains) compressions and rarefactions <b>or</b> particles come closer/further apart	(contains) crests and troughs	
speed 300–330 m/s	wave slower (than sound)	

- (ii) method of generating sound, e.g. (loud) speaker (and signal generator) B1  
 apparatus that enables refraction clear, e.g. carbon dioxide in balloon or any shape where refraction is possible B1  
 method of detecting refraction, e.g. microphone and how it is used to show refraction B1

- 10 (a) (i) 1 S-pole on right of core B1  
 2 N-pole anywhere on vertical section of armature B1  
**and** S-pole anywhere on horizontal section of armature  
**or**  
 N-pole on left of vertical section of armature **and** S-pole on right
- (ii) poles (on core) reverse/change positions B1  
 (armature still) attracted (to core) B1
- (iii) (iron is a) temporary magnet B1  
**or** (iron) easily demagnetised  
**or** steel retains magnetism  
 when current off/no battery/switch off/circuit open B1  
**and**  
 armature released/does not stay attracted/opens connections (at AB)

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(b) (i)	thermistor	B1
(ii)	resistance (of X) decreases	B1
	current (in coil) increases <b>or</b> more voltage across coil	B1
	<b>and</b>	
	<b>either</b> relay switch closes <b>or</b> circuit (to bell) complete	
(iii) 1	$(V=) IR$ <b>or</b> $1.5 (\times 10^{-3}) \times 2000$	C1
	3(.0)V	A1
2	9(.0)V	B1
3	12/200 <b>or</b> 0.06 (A) <b>or</b> 60 (mA) seen	C1
	<b>or</b> $(R_T =) 195(.12\Omega)$	
	61(.5) mA <b>or</b> 0.061(5) A <b>or</b> 62 mA <b>or</b> 0.062 A	A1
(iv)	light dependent resistor <b>or</b> LDR	B1
11 (a) (i)	distance (travelled) per second <b>or</b> speed	C1
	distance (travelled) per second / speed in a given direction	A1
	<b>or</b> displacement / time	
	<b>or</b> change in displacement per unit time	
	<b>or</b> displacement (travelled/covered) per unit time	
	<b>or</b> rate of change of displacement	
(ii)	opposite direction	B1
(iii) 1	value seen for $v$ and corresponding value of $t$	C1
	$0 < t \leq 1.4$ and $0 < v \leq 14$	
	$(a=) v-u/t$ algebraic or numerical equation	C1
	$10 \text{ m/s}^2$	A1
2	sensible comment	A1
(iv) 1	4(.0s)	B1
2	weight <b>or</b> force due to gravity mentioned (at D)	B1
	mention of	B1
	<ul style="list-style-type: none"> <li>• upwards force (on man) from cord</li> <li>• tension / elastic force from cord (on man)</li> </ul>	
	force in cord / upward force / tension greater than downwards force	B1
	<b>or</b> resultant force upwards	
(b) (i)	5000	B1
	20000	B1
(ii)	$(h =) PE / mg$ <b>or</b> $5000 = 50 \times 10 \times h$	C1
	10 m	A1