CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the May/June 2014 series

5054 PHYSICS

5054/22 Paper 2 (Theory), maximum raw mark 75

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1 (a) (i) *D* **and either** lorry accelerates (forward) **or** resultant force is forward [B1]

(ii) air resistance **or** (air) drag **or** friction (between tyres and road) [B1]

(b) (i) 30 000 kg [B1]

(ii) (a=) F / m algebraic in any form or numerical [C1]
0.5(0) m/s^2 [A1]

(c) direction or velocity is changing **or** acceleration or force is sideways or towards centre (of circle) [B1]

[6]

2 (a) (i) (P=) F / A algebraic in any form or numerical [C1]
33 N/cm^2 **or** 3.3×10^5 N/m^2 [A1]

(ii) 170 N **or** 167 N **or** 166.7 **N or (i)** $\times$ 5 with unit [B1]

(b) volume (of oil) remains the same
or oil passes from small(er) to large(r) area
or work = Fd **and** force large so distance small [B1]

(c) output ÷ input **or** fraction or percentage of work mentioned [C1]
complete definition, e.g. **useful** work obtained ÷ (total) work put in [A1]

[6]

3 (a) (i) any sensible example where expansion is useful [B1]

(ii) any sensible example where expansion causes a problem [B1]

(b) (molecules) move fast(er) or vibrate fast(er) or have more (kinetic / potential / internal) energy [B1]

(molecules) move apart or distance between molecules increases or vibration has larger amplitude or vibration takes up more space or bonds stretch [B1]

(c) slightly smaller [B1]
much larger [B1]

[6]

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4 **(a)** **(i)** up and down clear, e.g. by double headed arrow **or** down [B1]

(ii) any correct distance between consecutive points in phase [B1]

(iii) correct distance [B1]

(b) measure number of oscillations / count waves (passing) in a stated time or time at least one oscillation [B1]
show how to calculate number of oscillations per second [B1]

(c) **moves** (hand or rope) with slow(er) speed or rate / less frequency / less times per sec [B1]

[6]

5 **(a)** ultra violet **and** infra-red [B1]

(b) blue refracts / bends / deviates more [B1]
blue slows more (than red when entering glass) or blue and red have different speeds (from each other in glass) [B1]
blue and red have different refractive indices [B1]

[4]

6 **(a)** **(i)** any single value between 0 and 5.6 cm or a range all of whose values are correct [B1]

(ii) any value beyond 5.6 cm [B1]

(b) **(i)** ray through optical centre undeviated [B1]
other ray correct through or to axis 2.8 cm (± ½ small square) from lens [B1]

(ii) lines drawn meet after 11 cm or rays do not meet (on page) or rays almost parallel [B1]

(iii) inverted, magnified, real all 3 needed and none wrong [B1]

[6]

7 **(a)** **(i)** **horizontal** arrow to right (by eye) [B1]

(ii) forces / resultant causes moment or (turns because) force is not at pivot [B1]

(b) mark made at one end/pole/direction of compass (on paper) [B1]
move compass so that other end of compass is on mark **and** remark [B1]
join marks made as compass moved on in some way (to draw line) [B1]

[5]

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8 **(a)** **(i)** electron(s) and proton(s) [B1]

(ii) neutron(s) and proton(s) [B1]

(b) **(i)** top box 14 [B1]
bottom box 7 [B1]

(c) **(i)** sensible halving seen, e.g. 2.4 → 1.2 **or** two halves clear **or** ½ × ½ seen [C1]
11 400 **or** 11 000 years [A1]

[6]

9 **(a)** straight line from (0, 0) to (3, 2.4) [B1]
horizontal line from 3 s to 8 s [B1]
straight line from **end of a horizontal line** to zero in 1 s [B1]

(b) constant / same increase in velocity **or constant** change in velocity [C1]
constant / same increase in velocity per sec / unit time [A1]

(c) occurs in a short(er) time
or acceleration took 3 s and deceleration took 1 s [B1]

(d) (d =) speed × time numerical or algebraic **or** area under graph clear [C1]
1.2 × 3 **or** 3.6 (m) **or** 2.4 × 5 **or** 12 seen [C1]
15.6 m **or** 16 m [A1]

(e) **(i)** mgh seen in any algebraic or numerical form, e.g. 30 × 10 × 1.6 [C1]
480 J [A1]

(ii) heat or thermal energy or sound produced
or work done against friction / air resistance [B1]

(f) at least two distances and corresponding times mentioned [C1]

how the **actual measurement** is made, e.g. **(any one from)**
- make mark on ground every second and **measure** distances
- note video position every sec and use a scale to **find** distances
- make mark on ground every meter and **measure / take** time as girl passes [A1]

how constant speed is proved using measurement, e.g. **(any one from)**
- same distance between each position for the same time interval
- same time interval for equal distances
- $\Delta d / \Delta t$ constant **or** slope of distance-time graph constant [B1]

[15]

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10 (a) (i) (conduction occurs) through or in metal / pan **or** from water to metal / pan
or molecules vibrate **or** molecules collide
or (free) electrons (in metal) move [B1]

vibration / energy / heat passed **from molecule to molecule** clear
or energy passed on by electrons colliding (with atoms/molecules or electrons) [B1]

(ii) hot air or air over water rises or hot water rises [B1]
hot air or hot water expands **or** hot air or water less dense [B1]

(b) (i) black objects radiate heat more (than white) [B1]

(ii) (both) graphs higher (after start)
or temperature falls less (in same time) / slower
or takes longer to cool [B1]

less **evaporation** occurs **or** less **convection** [B1]

(c) (i) heat / energy to change the temperature by 1° C / unit temp [C1]

heat / energy to change the temperature of 1 kg / unit mass by 1° C / unit temp [A1]

(ii) long time to warm / boil water / cook
or scalds / burns when touched
or more energy needed (to warm water) [B1]

(iii) **1.** 34(° C) **or** 94–60 seen [C1]
(m=) Q / cΔT algebraic or numerical with any clear Q or ΔT [C1]
0.5(042) kg [A1]
2. 0.50 × 4200 × 54 [C1]
110 000 **or** 114(353) J [A1]

[15]

11 (a) ammeter and voltmeter correct symbols [B1]
ammeter in series with lamp [B1]
voltmeter in parallel with lamp [B1]

(b) R limits or reduces the current / voltage [B1]
otherwise lamp blows
or more of the 50 Ω can be used to adjust voltage / current [B1]

(c) (i) 12 V, 0.25 A correctly plotted (by eye) [B1]
curved line from origin [B1]
correct curvature – decreasing slope [B1]

(ii) straight line (for fixed resistor) [B1]
lamp has changing temperature or changing resistance
or fixed resistor has constant temperature or constant **resistance** [B1]

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(d) (i) (I =) V / R in any algebraic or numerical form, e.g. 12 / 50 [C1]
0.24 A [A1]

(ii) 0.49 A [B1]

(iii) 6(.0) V [B1]

(iv) 12(.24) Ω [B1]

[15]

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