



**General Certificate of Secondary Education  
2011**

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**Science: Physics**

Paper 2  
Higher Tier

**[G7605]**

**WEDNESDAY 15 JUNE, MORNING**

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**MARK  
SCHEME**

- 1 (a) (i) The coils touch/cannot be compressed any more REACHED ITS LIMIT [0] [1]
- (ii) Column headings – Load(Force)[1] in N [1] } ind. [2]  
 Compression [1] in cm [1] } marks [2]  
 Values Load 0 2 4 6 8 10 } GIVE CREDIT FOR VALUES [3]  
 Comp 0 1 2 3 4 5 } IF NO HEADINGS  
 ½ for each pair round down WRONG HEADING TO VALUES GIVE [0]  
 VALUES >10N – NO CREDIT
- (iii) X axis – Load Y-axis Compression – OR VICE VERSA [1]  
 Straight [1] line through 0,0 [1] give marks if no label [2]  
 curved at end [0] wrong labels – 0
- (b) (i) Moment = force × distance  
 = 15 × 0.4 [1]  
 = 6 or 600 [1]  
 N m N cm [1]  
 Clockwise [1]
- (ii) Upward at the biceps – upward arrow between elbow (pivot) and inner crook of upper arm. [1]
- (iii) Equal/balanced [1]  
 FORCES BALANCED give [0] unless equal/balanced given
- (c) (i) Towards the centre (of the circle) [1]
- (ii) Tension [1] in the string [1] [2]  
Electrical attraction [1] between electron and nucleus [1] [2]  
Friction [1] between tyres and road [1] [2]  
 underlined essential before 2nd mark can be given
- (iii) Arrow at a tangent judge by eye to circle at P or passing through P to the left [1]
- (d) (i) Weight of C = 3 (N) [2]  
 If Weight of B = 5N give 1 mark
- (ii) Pressure = Force/Area [1]  
 = 14/700 NO ECF – IF WRONG WEIGHT [1]  
 = 0.02 (N/cm<sup>2</sup>) [1]  
 or 200 (Pa)
- $\frac{3}{700}$  or  $\frac{6}{700}$  or  $\frac{5}{700}$  – SUBSUMED  
 1 mark only

AVAILABLE  
MARKS

30

- 2 (a) (i) Not animals
- Plants/vegetation absorb sunlight/photosynthesis [1]  
 Plants (die) and are buried/over a long time (>1 million years) [1]  
 High temperature/pressure convert them to coal [1]
- (ii) Solar radiation heats up the surface/short  $\lambda$  radiation passes through [1]  
 Heat re-radiated from surface [1]  
 Is absorbed by atmosphere [1]  
 REFLECTED – give 0. OZONE – MARK UP TO YOU  
 SEE IT THEN STOP.
- (b) (i) Gases such as carbon dioxide/sulphur dioxide not released [1]  
 LESS BURNING OF FOSSIL FUELS/LESS ACID RAIN.  
 LESS ATMOSPHERIC POLLUTION.
- (ii) Radioactive waste products/NUCLEAR WASTE [1]  
 TOXIC [0] DANGEROUS [0] POSSIBILITY OF A  
 NUCLEAR ACCIDENT [1]
- (iii) Uranium/plutonium [1]  
 Non-renewable ← AWARD IF NAME OF FUEL NOT GIVEN [1]
- (iv) Specialist personnel/Equipment/storage/storage time. [1]  
Due (to the dangers of) radioactivity ← essential for 2nd mark. [1]  
 Loss of land use – 1st mark.
- (c) (i) Energy cannot be created or destroyed = energy in = energy out [1]  
 It can only change its form/converted. [1]
- (ii)  $40 - 30 = 10$  kJ or 25%. 10 [0] [1]
- (iii) Efficiency = useful output energy/total input energy [1]  
 =  $30/40$  [1]  
 = 0.75 or 75% 0.75% NO ANSWER MARK. [1]
- (iv) Power = work done/time taken [1]  
 =  $30/12$  [1]  
 = 2.5 kW needed. 2.5 – [2] [1]
- (v) Work done = force  $\times$  distance [1] [1]  
 $15000 = F \times 0.03$  [1] or  $F = 15000/0.03$  [1] [2]  
 $F = 500\,000$  (N) [1]  
 500 kN

AVAILABLE  
MARKS

25

- 3 (a) (i) 2 cm [1]
- (ii)  $\frac{20}{5}$   
 $= 4$  [1]  
Hz [1]  
[1]
- (iii)  $v = f\lambda$  [1]  
 $= 4 \times 2$  [1]  
 $= 8$  allow ecf for frequency and wavelength [1]
- (iv) Wavefronts refracted towards the boundary [1]  
Straight and parallel [1]  
Shorter wavelength only if refraction correct [1]  
Refracted wavefront continuous with incident one [1]  
AND NO MORE [1]
- (v) Wave slows down [2] change of speed only give 1 [2]  
increase of speed [0]
- (b) (i) US is sound of frequency greater than 20 kHz [2]  
(sound) above our range of hearing [1]
- (ii) DISTANCE = (speed  $\times$  time) [1]  
 $= (5000 \times \underline{0.0001})$  [1] NOT DIVIDING [2]  
by 2 max. 2 marks  
 $= 0.25$  or  $25^2$  [1]  
m cm [1]
- (c) Arrangement – Firstly sound made in air [1]  
– Secondly sound made in material [1]  
– Second sound produces a shorter  
time/SHORTER TIME GIVES FASTER SPEED [1]  
REPEAT and AVERAGE RECORD TIME [1]
- QWC [2]

AVAILABLE  
MARKS

25

- 4 (a) (i)  $X \rightarrow Y$  [1]
- (ii) A to the left [1]  
 B into coil (to the left) [1]  
 C to the right [1]
- (iii) Only magnetised when a current is flowing/electricity on electrically charged [0] [1]
- (iv) Iron/steel/nickel/cobalt [1]
- (v) Add more turns/loops/coils/coils closer [1]
- (b) (i) a.c. (sinusoidal) waveform [1]  
 d.c. any line/curve that does not cross the time axis. [1]
- (ii) Move the magnet  
 Towards and away from coil/side to side rotate [2] or [0]
- (iii) Move the magnet } BOTH NEEDED [2] OR [0] [1]  
 in one direction } [1]
- (c) (i) A Step – up [1]  
 More turns on secondary (than the primary) [1]  
 B Step – down [1]  
 Fewer turns on the secondary (than the primary) [1]
- (ii) Current is reduced/less energy/heat loss less resistance [0] [1]
- (d) (i)  $N_p/N_s = V_p/V_s$  STEP UP RATIO 20 [1] [1]  
 $300/N_s = 240/12$  [1]  
 $N_s = 15$  [1]
- (ii) Two coils shown wrapped on the iron core – coils in series [0] [1]  
 NO FURTHER CREDIT  
 one coil (connected) to 240 and other coil to 12 V [1]  
 Primary turns greater than secondary turn [1]
- (iii) input is a.c.  
 output is a.c. – both needed [1]

AVAILABLE  
MARKS

25

- 5 (a) Planet X at 1 – day longer  
Planet X at 2 – day shorter  
Planet A at 3 – same length  
Planet A at 4 – same length [4]
- (b) The distance [1]  
light travels in 1 year ← only give credit if distance mark given [1]
- (c) (i) (Gas) particles are drawn closer together/condense compress/  
density increases [1]  
Due to gravity [1]
- (ii) Temperature has to increase/heats up [1]
- (iii) Planets [1]
- (iv) All orbit (the Sun) in same plane/same direction [1]
- (d) (i) Geocentric – Earth at centre [1]  
Heliocentric – Sun at centre (of the universe – 0) [1]
- (ii) The closer Perigee [1] to the Earth the force gets greater [1]  
changes gets [1] [2]
- (e) (i) The creation of the Universe [1]  
in a large explosion ← dependant on 1st line [1]
- (ii) Light from (distant) galaxies – NOT STARS [1]  
is shifted to longer wavelength/red end of spectrum [1]  
showing that they (galaxies) are moving away/universe is  
expanding [1]

**Total**

20

**125**