Rewarding Learning

General Certificate of Secondary Education
2011

Science: Physics

Paper 2
Higher Tier

[G7605]

WEDNESDAY 15 JUNE, MORNING

MARK
SCHEME

1 (a) (i) The coils touch/cannot be compressed any more [1]
REACHED ITS LIMIT [0]

(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
Comp 0 1 2 3 4 5   } IF NO HEADINGS [3]
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) <u>Tension</u> [1] in the string [1] [2]
<u>Electrical</u> attraction [1] between electron and nucleus [1] [2]
<u>Friction</u> [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/cm²) [1]
or 200 (Pa)

$$\frac{3}{700} \text{ or } \frac{6}{700} \text{ or } \frac{5}{700} - \begin{array}{l} \text{SUBSUMED} \\ \text{1 mark only} \end{array}$$

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 λ 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 × distance   [1] [1]
$15000 = F \times 0.03$ [1] or $F = 15000/0.03$ [1] [2]
$F = 500\,000$ (N) [1]
500 kN

25

6350.01

3 **(a)** **(i)** 2 cm [1]

(ii) $= \dfrac{20/5}{4}$ [1]

Hz [1]
[1]

(iii) v = fλ [1]
= 4 × 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
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
(sound) above our range of hearing [1] [2]

(ii) DISTANCE = (speed × time) [1]
= (5000 × 0.0001) [1]   NOT DIVIDING [2]
by 2 max. 2 marks
= 0.25 or 25² [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]   25

4 **(a) (i)** X → 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 [1]
electrically charged [0]

(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 ⎫ [1]
in one direction ⎭ BOTH NEEDED [2] OR [0] [1]

(c) (i) A Step – up [1]
More turns on <u>secondary</u> (than the <u>primary</u>) [1]
B Step – down [1]
Fewer turns on the <u>secondary</u> (than the <u>primary</u>) [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]   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] 20

Total **125**