NAME_____

Hartismere School

GCSE to AS Physics

Bridging Questions

Solutions

Section A: Standard form and transposing formulae

1.) Make F the subject of P = F/A

P=F/A, PA=F, F=PA

2.) Make x the subject of F = kx

F=kx, F/k=x, x=F/k

3.) Make v the subject of p = mv

P=mv, p/m=v, v=p/m

4.) Make u the subject of v = u + at

v = u + at
v-at = u, u = v - at

5.) Make s the subject of $v^2 = u^2 + 2as$

$v^2 = u^2 + 2as$

$v^2 - u^2 = 2as$

$$\frac{v^2 - u^2}{2a} = s$$

6.) Make a the subject of $s = 0 + \frac{1}{2} at^2$

$$s = \frac{1}{2}at^2, \qquad 2s = at^2, \qquad \frac{2s}{t^2} = a$$

7.) Write the following in standard form to 3 significant figures. E.g. 236987325 = 2.37×10^8

i) 23569689253 = 2.36×10^{10}

ii) 12kW = $1.20 \times 10^4\ W$

iii) 0.00002368 = 2.37×10^{-5}

iv) 12.5nm = $1.25 \times 10^{-8}\ m$

v) 1236589 x 12358 x 0.123 = 1.88×10^9

vi) 1569μs = 1.57×10^{-3}

vii) 10kW x 15GW = $2.36 \times 10^{10}\ W$

viii) 0.236 x 10^{-9} x 3.62x10^{-12} = 8.54×10^{-22}

ix) 15mm x 15mm x 15mm (in m^2) $3.38 \times 10^{-6}\ m^2$

x) 3x10^8 / 15THz 2.00×10^{-5}

6. For each of the following, give the full name of the SI unit used.

(a) coulomb (1) 1
(b) farad (1) 1
(c) hertz (1) 1
(d) pascal OR newton per square metre (1) 1
(e) newton per kilogram (1) 1
(f) weber (1) 1
(g) becquerel (1) 1

[Total 7 marks]

Section B: Multiple Choice

D, B, B, D

Section C Other past paper Qs

1. (i) energy due to position / height / above the ground B1
depends on gravitational field strength / weight B1
or mgh / wh B1 and symbols defined as mass, gravitational field strength and height / weight and height B1

(ii) energy **due to** movement / motion B1
depends on mass and speed B1
or ½mv^2 B1 and symbols defined B1

(iii) work is the rate of doing work or rate of using energy B1
(work done/time taken)

[5]

2. (i) velocity = displacement / time or rate of change of displacement B1

(ii) acceleration = change in velocity / time or rate of change of velocity B1

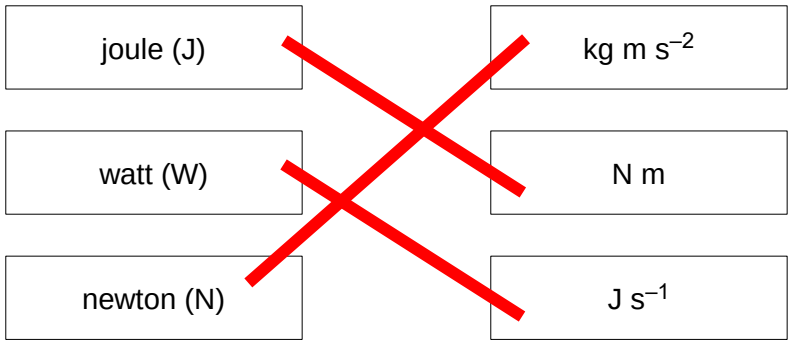
[2]

3. (i) Moment is the force × the perpendicular distance
from (the line of action of) the force to the pivot/point
(missing perpendicular –1, missing from the force to
the pivot / point –1) B2

(ii) Torque of a couple: one of the forces *x* B1
perpendicular distance between (the lines of action of) the forces

[3]

4. Draw a line from each unit on the left-hand side to the correct equivalent unit on the right-hand side.



Total 2 marks]

5. extension (or compression) ∞ force (as long as
elastic limit is not exceeded)

6. (i) Stress = force / cross-sectional area B1

(ii) Strain = extension / original length B1

[2]

7. (a) A brittle material does not have a plastic region / it breaks at its elastic limit. B1

(b) Ultimate tensile strength is breaking stress for a material B1
Materials can be chosen / tested to prevent collapse of the bridge B1

[3]

8. Energy cannot be created or destroyed; it can only be transferred/transformed into other forms
or
The (total) energy of a system remains constant
or
(total) initial energy = (total) final energy (AW)

Allow: *'Energy cannot be created / destroyed / lost'*

B1

[1]

9. (Force is 1 N) when a **1 kg** mass has an acceleration of **1 m s^{-}**

Not*: '1 kg and 1 m* ***s^{-1}*** *'*
Allow: *(1 N =)* ***1 kg*** × ***1 m s^{-2}***

B1

[1]

10. (a) A quantity that has (both) magnitude / size and direction

Not *'A quantity that has direction'*

B1

(b) Circled /underlined quantities are:
acceleration, displacement and weight

Note: *All three need to be identified for a mark*

B1

[2]

11. (a)… ***immediately*** *after jumping*
Only force is the weight because drag = 0 OR the net force = weight [1]
acceleration = *g*/9.8(1 m s^{-2}) [1]
(Allow 'mg' for weight. Do not allow 'gravity' for weight.)

… ***before*** *terminal velocity is reached*
Any **two** from: [2]
- Drag increases (with speed) /drag ∞ speed^2
- Net OR resultant OR total force decreases
- Acceleration is less than *g*

… ***at*** *terminal velocity*
weight = drag / net force = 0 [1]
acceleration = 0 /constant speed or velocity (AW) [1]

(b) (Transformed to) heat/thermal (energy)

Not*: 'Friction'/sound*

[1]

(c) Any **two** from: [2]

1. The terminal velocity increases
2. Initial gradient/slope is the same/equal to *g*
3. Time taken to reach terminal velocity is longer [9 MARKS TOTAL]

12. $F_H = 20\cos 38 = 15.76 \approx 15.8$ (N)

***Allow**: 2 sf answers of 16 (N) and 12 (N)*

B1

$F_V = 20\sin 38 = 12.31 \approx 123.3$ (N)

***Allow**: 1 mark if vertical and horizontal components have been interchanged*

B1

[2]

13.

(i) Constant / steady / uniform acceleration (up to 4 s)
Or Velocity increases at a steady / constant / uniform rate Or Has acceleration of 3.5 (m s^{-2})

***Not** Accelerates up to 4 s / 'uniform motion' for the first B1 mark*
***Not** 'Accelerates at a constant rate'.*

B1

Constant / steady / uniform velocity (after 4 s)
Or Zero acceleration
Or Travels at a velocity of 24 (m s^{-1})

***Allow**: 'speed' instead of velocity*

***Allow**: 2 mark for 'Constant acceleration and then constant speed / velocity'*

B1

(ii) distance = area (under graph)

***Allow**: The C1 mark is for ... distance* $= \frac{1}{2}(10 + 24) \times 4.0$

C1

distance = 68 (m)

***Allow**: Bald 68 (m) scores 2 marks*
Bald $\frac{1}{2}(4 \times 14)$ *or 28 (m) scores 1 mark for 'area of triangle'*

A1

(iii) 1 Answer in the range: 1.1 to 1.2 (s)

B1

2 Same areas under graphs

$14t = 10t + (0.5 \times 3.5 \times t^2)$

C1

$t = 2.28$ (s) ≈ 2.3 (s)

A1

[7]

14. (i) weight in the range 200 to 1200 (N)

B1

(ii) area in the range 0.01 to 0.08 (m^2)

B1

(iii) pressure = (i)/(ii)

Allow: *1 sf answer*

B1

[3]

15. (i) It has maximum / large / increased stress at this point

Allow: *it has 'same force but thinner/smaller area'*
Not: *Thin / small area*

B1

(ii) The tape has (permanent) extension / deformation when the force / stress is removed (AW)

Note: *Need reference to force or stress removed*
Allow: *'...does not return to original size / shape / length when force / stress is removed'*

B1

[2]

16.

(a) (i) use of area beneath graphs (1)
acceleration section 125 m and deceleration section 50 m (1)
constant velocity sections and total
50 m + 200 m + 125 m + 50 m = 425 m (1) 3

(ii) 2 straight line sections correct (1)
2 acceleration / deceleration sections correct (1)
smooth transition between sections OR zero speed at end (1) 3

(b) (i) at least three points correctly calculated and drawn (1)
straight line towards origin (1) 2

(ii) 240 (V) (1) 1

(iii) gradient is reciprocal of the e.m.f. (1) 1

(c) (i) e.g. $\frac{0.18-1.16}{7.2-6.7}=-\frac{0.98}{0.5}$ = –1.98 correct approach for gradient (1)
1.96, 1.97, 1.98 as values for accuracy mark (1)
– sign scores 1 (1) 3

(ii) g α $1/r^2$ OR g inversely proportional to the square of the distance from the centre of the Earth (1) 1

[14]

17. Scale diagram:
correct triangle / parallelogram drawn on the figure M1

scale stated and correct resultant arrow A1

resultant force 25 to 26 (N) B2
resultant force 24 to 27 (N) B1

Value calculated:
correct triangle drawn M1

correct triangle labelled (arrows and labels which includes the resultant with an arrow in the correct direction) A1

valid method of calculation: (e.g. cosine rule) / resolve into horizontal (12 + 16cos50) and vertical (16sin50) components and use of Pythagoras C1

25.(4) (N) A1

[4]

18. (a) zero (do not allow 'small') (1) 1

(b) 300 W for 1 watt therefore 300 W × 20 for 20 W 6000 W (1) 1

(c) e.g. if run at 92 K there is a danger that superconductivity will cease as a result of a slight temperature rise (1)
a 15 K difference provides a safety region (1)
77 K is the boiling point of liquid nitrogen (1)
other sensible suggestion (1) 2
MAXIMUM (2)

(d) (i) area of cross-section of wire = 10^{-6} m^2 (1)

current = 10^{-6} m^2 × 2.0 × 10^8 A m^{-2} (1)
= 200 A (0) 2

(ii) $B = \frac{1.26\times10^{-6}\times200\times3200}{2\times0.30}$ (1)
= 1.34 T (1) 2

(e) (i) $F = BQv$ (1) 1

(ii) $BQv = m \times \frac{v^2}{r}$ (1)
$r = mv/BQ$ (1)
m = 235 × 1.66 × 10^{-27} kg (1)
$r = \frac{235\times1.66\times10^{-27}\times8.3\times10^5}{1.34\times1.6\times10^{-19}}$ = 1.51 m (1) 4

(iii) circular paths for both ions (1)
U–235 ion with slightly smaller radius (1)
paths curving upwards (1) 3

[16]