INDUCTION ASSIGNMENT MARKSCHEME

1. current $= \frac{\text{voltage}}{\text{resistance}}$

$= \frac{12V}{150\Omega}$ ✓

$= 0.08$ ✓

A ✓ 3

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2. (a) (i) top diagram shows:

1. circular waves ✓

lower diagram shows:

2. less diffraction than top diagram ✓

either diagram shows:

3. at least three waves shown ✓

4. no change in wavelength in these waves ✓ 4

(ii) wavelength ✓ 1

(b) (i) wavelength $= \frac{\text{speed}}{\text{frequency}}$ [use of]

$= \frac{330\,\text{m/s}}{1000\,\text{Hz}}$ ✓

$= 0.33$ ✓

m ✓ 3

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3. (c) (i) $KE = ½ \times m \times v^2$

$= ½ \times 85 \times 12^2$ ✓

$= 6120$ ✓

J ✓ 3

(ii) $\text{time} = \frac{\text{energy}}{\text{power}}$

$=$ 6120 J / 180 W;[Allow ecf] ✓

$=$ 34 ; ✓

s; ✓ 3

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4. (a) (i) g.p.e. = mgh

$=$ $1.5 \times 9.8 \times 1.2$; ✓

$=$ 18; (17.64) ✓

J; ✓ 3

(ii) power out $= \frac{\text{work done}}{\text{time}}$;

$= \frac{18}{4}$; ✓[Allow use of 17.64]

$=$ 4.5 ✓ [gives 4.41]

W; ✓

[Accept ecf from part (a)(i)] 3

(iii) efficiency $= \frac{\text{power out}}{\text{power in}} (\times 100)$

$= \frac{4.5}{30} (\times 100)$ ✓

$=$ 0.15 (15 %) ;[Allow ecf] ✓ 2

(b) friction (with moving parts)/heat produced/sound/sparking; ✓

[Reject light] 1

5. (a) (i) voltage has both + and – values/either direction; ✓ 1

(ii) amplitude - (±) 2.6 (V) ✓
period - 0.024 (s) ✓ 2

(iii) $f = \frac{1}{T} = \frac{1}{0.024\text{s}}$; ✓
= 41.7 ;[Allow ecf from (ii)] ✓
Hz ✓ 3

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6. (a) A description to include:
1. upward push/reaction/thrust; ✓
2. of the **ground** on the athlete; ✓ 2

(b) (i) 0.39 (s); ✓
[Accept 0.4 (s)] 1

(ii) height = area below graph / average velocity × time; ✓
$= \frac{1}{2} \times 3.8 \times 0.39$; [Allow ecf from (b)(i)] ✓
= 0.74; ✓
m; ✓ 4

[Allow use of 4.0]

(iii) acceleration = $\frac{(v - u)}{t}$;
$= -\frac{7.6}{0.78}$; [allow $-\frac{3.8}{0.39}$] ✓
= - 9.7 ✓
m/s^2 ✓ 3

(iv) downwards; ✓
negative gradient/backwards slope/athlete slowing down/
retardation/deceleration; ✓ 2

(v) F = ma;
= 65 kg × 9.7 (m/s^2) [Allow ecf from b(iii)] ✓
= 630 – 633 ✓
N ✓ 3

(vi) downward pull of the Earth/gravitational pull; ✓
[Reject gravity] 1

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7. (a) (i) copper ions towards negative plate ie to right
sulphate ions towards positive plate ie to left; ✓ 1

(ii) ammeter/M_2; ✓
moving charges make a current; ✓ 2

(b) (i) Q = It;
= 0.5 × 5 × 60 ✓
= 150 ✓
C ✓ 3

(ii) $150/(3.2 \times 10^{-19})$ ✓
4.688×10^{20} ✓ 2
[Allow ecf from part (b)(i)I

(iii) W = V× Q
= 6 × (3.2 × 10.19) ✓
$= 1.92 \times 10^{-18}$ ✓
J ✓ 3

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8. (a) Any two from:
1. all transverse waves; ✓
2. all travel at the speed of light; ✓
3. can all travel in a vacuum; ✓ 2

(b) (i) red ✓ 1

(ii) violet/blue ✓ 1

(c) λ = c/f
$= 3.0 \times 10^8/4.0 \times 10^{12}$ ✓
$= 7.5 \times 10^{-5}$ ✓
m ✓ 3

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9. use of Pythagoras
$R = \sqrt{(500^2 + 1200^2)}$ ✓
= 1300 ✓
N ✓ 3

Use of tanθ
tanθ = 500/1200 ✓
= 0.4167 ✓
θ = 23° ✓ 3