

**M1.** (a) (sound waves) which have a frequency higher than the upper limit of hearing for humans

**or**

a (sound) wave (of frequency) above 20 000 Hz

*sound waves that cannot be heard is insufficient*

*a wave of frequency 20 000 Hz is insufficient*

1

(b) 640

*an answer of 1280 gains 2 marks*

*allow 2 marks for the correct substitution*

*ie  $1600 \times 0.40$  provided no subsequent step*

*allow 2 marks for the substitution  $\frac{1600 \times 0.80}{2}$*

*provided no subsequent step*

*allow 1 mark for the substitution  $1600 \times 0.80$  provided no subsequent step*

*allow 1 mark for the identification that time (boat to bed) is 0.4*

3

(c) any **one** from:

- pre-natal scanning / imaging
- imaging of a named organ (that is not surrounded by bone), eg stomach, bladder, testicles

*accept heart*

*do **not** allow brain **or** lungs (either of these negates a correct answer)*

- Doppler scanning blood flow

1

(d) advantage

any **one** from:

- (images are) high quality or detailed or high resolution  
*clearer / better image is sufficient*
- (scan) produces a slice through the body
- image can be viewed from any direction  
*allow images are (always) 3D / 360°*
- an image can be made of any part (inside the body)  
*allow whole body can be scanned*
- easier to diagnose **or** see a problem (on the image)

1

disadvantage

any **one** from:

- (the X-rays used **or** scans) are ionising  
*allow a description of what ionising is*

- mutate cells **or** cause mutations **or** increase chances of mutations  
*allow for cells:*  
*DNA / genes / chromosomes / nucleus / tissue*
- turn cells cancerous **or** produce abnormal growths **or** produce rapidly growing cells
- kill cells  
*damage cells is insufficient*
- shielding is needed  
*can be dangerous (to human health) unqualified, is insufficient*

1

[7]

- M2.** (a) (i) air resistance/drag/friction (or upthrust)  
weight/gravitational pull/gravity  
*for 1 mark each* 1
- (ii) air resistance/friction acts in opposite direction to motion 1
- (iii) Y 1
- (iv) the sky-diver accelerates/his speed increases  
in downward direction/towards the Earth/falls  
*for 1 mark each* 2
- (b) force X has increased force Y has stayed the same the speed of the sky-diver  
will stay the same  
*for 1 mark each* 3
- (c) (i) CD 1
- (ii) 500m } (but apply e.c.f. from (i))
- (iii) 50s } 3
- (iv) 10 (but apply e.c.f. from (ii) and (iii))  
*gets 2 marks*
- or 500/50 or d/t  
*gets 1 mark* 2

[14]

**M3.** (a) (i) 3km [allow 2.9 to 3.1]  
*for 1 mark*

1

(ii) 6.6 min [allow 6.5 to 6.8]  
*for 1 mark*

1

(b) can be in any units, 1.5 km/min, 1500 m/min, 25 m/s, 90 km/h  
Sp = d/t  
=12/8  
=1.5  
km/min

*for 1 mark each (see marking of calculations)*

4

[6]

- M4.**
- (a) (i) Constant speed 2
- (ii) Accelerates to higher constant speed 1
- (b) (i) Points correct (allow one major or two minor mistakes)  
Line correct (for their points) 2
- (ii) 5 m/s  
or 5  
*gets 2 marks*
- or correct unit  
*gets 1 mark mark* 3
- (c) (i) 50 s or 50  
*gets 2 marks*
- or  $t = d/v$   
*gets 1 mark* 3
- (ii) Line correct (of gradient 4 and spans 30 consecutive seconds) 1
- (d) (i) 0.04 or 6/15  
*gets 2 marks*
- or  $a = v/t$   
*gets 1 mark* 3

[15]


M5. (i) C and D **or** D and C  
*accept CD*  
*accept DC*  
*accept answers in terms of time* 1


(ii) any **one** from:  
 streamline position streamline clothes  
*accept crouched position*  
*accept tight clothes*  
*accept design of cycle*  
*accept cycle slower* 1

(iii) 0.5 hours **or** 30 minutes **or** 1800 seconds  
*must have unit* 1

(iv) speed =  $\frac{\text{distance}}{\text{time (taken)}}$

*accept any correct rearrangement*  
*accept  $s = d/t$  **or**  $v = s/t$*   
*accept velocity for speed*

accept 

if subsequent use of  correct

1

(v) 16  
*allow for mark for each of time = 3.5 hours*  
*distance = 56km*  
*allow e.c.f. from part (a)(iii) if correctly used*  
*an answer of 14 gains 2 marks*  
*allow 1 mark for correct attempt to average the three sections* 3

[7]

M6. (a) 96

*allow 1 mark for correct substitution  
ie  $80 \times 1.2$*

2

newton or N

*allow Newton  
do **not** allow n*

1

(b) (i) direction

1

(ii) velocity and time are continuous (variables)

*answers must refer to both variables  
accept the variables are continuous / not categoric  
accept the data / 'it' is continuous  
accept the data / 'it' is not categoric*

1

(iii) C

1

velocity is not changing

*the 2 marks for reason may be scored even if A or B are  
chosen*

*accept speed for velocity*

*accept speed is constant (9 m/s)*

*accept **not** decelerating*

*accept **not** accelerating*

*accept reached terminal velocity*

1

forces must be balanced

*accept forces are equal*

*accept arrows are the same length / size*  
**or**  
resultant force is zero  
*do **not** accept the arrows are equal*

1

[8]



**M7. (a) B**

*reason only scores if B is chosen*

1

gradient / slope is the steepest / steeper  
*answers must be comparative*  
*accept steepest line*  
*ignore greatest speed*

1

(b) (velocity includes) direction  
*'it' refers to velocity*

1

**[3]**

- M8.** (a) distance is a scalar and displacement is a vector  
**or**  
distance has magnitude only, displacement has magnitude and direction 1
- (b) 37.5 km  
*accept any value between 37.0 and 38.0 inclusive* 1
- 062° or N62°E  
*accept 62° to the right of the vertical* 1
- accept an angle in the range 60° – 64°*  
*accept the angle correctly measured and marked on the diagram*
- (c) train changes direction so velocity changes 1
- acceleration is the rate of change of velocity 1
- (d) number of squares below line = 17  
*accept any number between 16 and 18 inclusive* 1
- each square represents 500 m 1
- distance = number of squares × value of each square correctly calculated – 8500 m 1

[8]

question	answers	extra information	mark
<b>9(a)</b>	48	allow for <b>1</b> mark correct method shown, ie $6 \times 8$ <b>or</b> correct area indicated on the graph	<b>2</b>
<b>9(b)</b>	diagonal line from (0,0) to (6,48) / (6, their (a))	if answer to (a) is greater than 50, scale must be changed to gain this mark	<b>1</b>
	horizontal line at 48m between 6 and 10 seconds	accept horizontal line drawn at their (a) between 6 and 10 seconds	<b>1</b>
<b>Total</b>			<b>4</b>