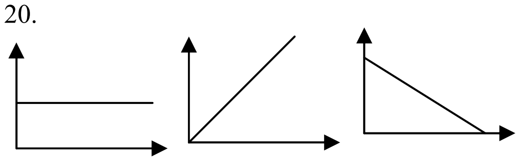
Answers:
Revision of speed & acceleration
Pages 3 & 4
Questions: 1 - 21

1. total distance divided by total time.
2. measure time taken to travel known distance & divide distance by time.
3. 98 km h^{-1}
4. 925 km
5. 429 s or 7.1mins
6. 7.08 m s-1
7. 3.6 m
8. 10.6 km s^{-1}
9. average speed over a very short distance
10. Attach mask of known length to trolley. Use light gate & timer to measure time to pass through gate. Divide length of mask by time taken.
11. Over short time, reaction time is more significant.
12. (a) 390 mins = 6.5 h
    (b) 2484 km
    (c) 383 km h^{-1}
13. (a) 12 m s^{-1}
    (b) 16 m s^{-1}
14. acceleration = change in speed divided by time
15. measure instantaneous speed at start & finish, and time between measurements. Use above equation
16. 4 m s-2
17. 0.125 s
18. 55 m s-1
19. 304 m s-1
20.



21. (a) 0
    (b) 0.5 m s-2
    (c) 20 m
    (d) 10 m
    (e) 9 m
    (f) 3.25 m s-1

Answers
Scalars & Vectors
Pages 5 & 6
Questions: 1 - 24

1.

Scalars	**Vectors**
mass	velocity
speed	displacement
area	acceleration
distance	
time	

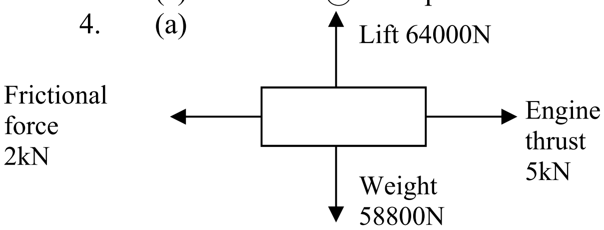
2. 112 km @ 342
3. 98 m @ 053
4. (a) 14 km
   (b) 10 km @ 037
   (c) 4.7 km h-1
   (d) 3.3 km h-1 @ 037
5. 0, 1.6 m s-1, 0
6. (a) 22 km
   (b) 6 km @ 107
   (c) 17.7 km h-1
   (d) 4.3 km h-1 @ 107
7. 63.3 m @ 071
8. 495 km @ 149
9. 42 km @ 109
10. (a) 283 m @ 241
    (b) 683 m
    (c) 136.6 s
    (d) 2.2 ms-1 @ 155
11. 26 ms-1 @ 023
12. (a) 3.6 ms-1 @ 34o S of E
    (b) 60 m @ 34o S of E
    (c) 17 s
13. 309 km, 1.5 hours
14. 20.4 kmh-1 @ 11o to original velocity
15. 13 ms-1 @112
16. Scale diagram
17. 130 miles @ 227^o
18. (a) 300m
    (b) 3ms^{-1}
    (c) 0m
    (d) 0ms^{-1}
19. a) 80km
    (b) 40kmh^{-1}
    (c) 20km North
    (d) 10kmh^{-1}
20. 900kmh^{-1}
21. 26ms^{-1}@022^o
22. 804kmh^{-1}@354.3^o (or 5.7^{o}W of N)
23. (a) 70m
    (b) 50m
    (c) 70s
    (d) 50ms^{-1}@ 053^o to the 30m vector
24. 44.5kmh^{-1}@270^o

Answers
Past exam paper Questions: Scalars & Vectors
Pages 7
Questions: 1 - 5

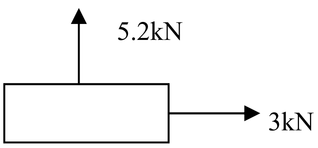
1. C
2. A
3. D
4. B
5. D

Adding Force Vectors
Pages 8 & 9
Questions: 1 - 11

1. (a) 17.3 N to right
   (b) 12.8 N @ 51o up from 10 N
   (c) 7.3 N @ 52o down from 3 N
   (d) 19.8 N @ 15o up from 5 N
   (e) 133 N @ 45o up from 60 N
   (f) 3.6 N @ 30o down from 5 N
   (g) 2 N @ to right
   (h) 1.4 N @ 43o down from 10 N
2. 22.4 N @ 73o up from 3 N
3. (a) 4000 N
   (b) 3000N
   (c) 5000 N @ 37o up from horizontal
4. (a)



(b)



(c) 6 kN @ 60^o up from horizontal
(d) 1 ms-2 @ 60^o up from horizontal

5. 37.4 N towards F
6. 100 kN forwards
7. 48.2 N
8. (a) 0.1 ms-2
   (b) 0.097 ms-2
   (c) 0.087 ms-2
   (d) 0.071 ms-2
   (e) 0.05 ms-2
9. 166^o
10. (a) 353.55N
    (b) 353.55N
11. 8.67N

Components
Pages 10 & 11
Questions: 1 - 8

1. **Horizontal Vertical**
   86.6 ms^{-1} 50ms^{-1}
   22.5 ms^{-1}39ms^{-1}
   290 N 135 N
2. Horizontal 129 N
   Vertical 153 N
3. Horizontal 9.3ms^{-1}
   Vertical 14.3 ms^{-1}
4. 0.64 ms^{-2}
5. (a) 17.3 ms^{-1}
   (b) 34.6 ms^{-1}
6. 11.2 N to the right
7. 8480 N parallel to the slope
8. (a) 6.65N@13^o to the 4N vector
   (b) 22.75N@ 54.6^o to the 10N vector

Past exam paper Questions: Vector Analysis
Pages 12 - 15
Questions: 1– 9

1. D
2. C
3. A
4. D
5. C
6. a). Each rope exerts a force in the direction of travel. To calculate the component of the force in the direction of travel use basic trigonometry.
   The force from each rope is:
   $F_{Direction\ of\ travel} = F_{Resultant}\cos 20^o$
   $F_{Direction\ of\ travel} = 150x\cos 20^o$
   $F_{Direction\ of\ travel} = 140.95N$
   The total force from both ropes (F_{total}) can now be calculated.
   $F_{total} = 2x140.95N$
   $F_{total} = 281.9N$
   b. As the boat is moving at constant speed, and in a straight line, the frictional force must be equal in magnitude to the pulling but acting in the opposite direction to the pulling force.
   $F_{friction} = -281.9N$ (-ve sign indicates direction)
7. Calculate the magnitude of the displacement vector (s) using Pythagoras' theorem and calculate the corresponding bearing using basic trigonometry.

$s^2 = AB^2+BC^2$	Let angle BAC = θ
$s^2 = 50^2+150^2$	$\tan\theta = BC/BA$
$s^2 = 2,500+22,500$	$\tan\theta = 150/50$
$s^2 = 25,000$	$\tan\theta = 3$
s= (25000)1/2	$\theta = \tan^{-1}3$
s= 158.11m	$\theta = 71.6^O$

S=158.11m at a bearing of **071.6^O**

8. 67.66N@ 20^o West of North

9.a.i. $F_{hor} = F_{Resultant}\cos\theta$
$F_{hor} = 4\cos 26^o$
$F_{hor} = 3.6N$

a.ii.

$F_{hor} = F_{un} = 4N$	$a = F_{un}/m$
m = 18kg	a = 4/18
a = ?	$a = 0.222m/s^2$

a.iii.

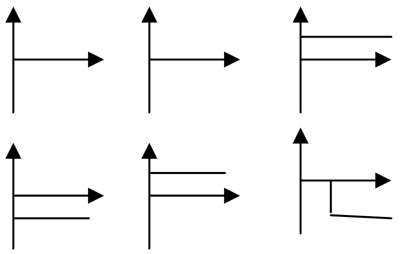
u = 0m/s	$s = ut + ½at^2$
$a = 0.222m/s^2$	$s = 0x7 + 0.5x0.22^2x72$
t = 7s	s = 5.44m
s = ?	

b. By decreasing the angle the cosine of the angle will increase.
This makes the horizontal force greater as :$F_{hor} = F_{Resultant}\cos\theta$
The accelerating force, and the consequent acceleration, is therefore greater.
Substituting a greater acceleration into the equation used in part a.iii. will result in a greater distance being calculated.

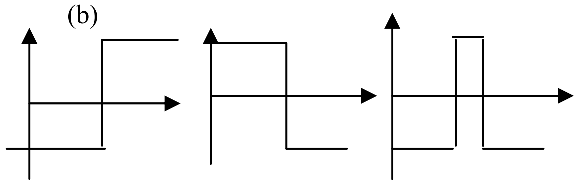
Graphs of Motion
Pages 16 – 21
Questions 1 - 19

1. (a) 0- 50s: constant acceleration
   50- 100: constant v / zero acc
   100-150 non uniform deceleration
   (b) 0- 50s: non uniform acceleration
   50- 100: constant v / zero acc
   100-150 constant deceleration
   (c) B as area under graph = distance travelled
   (d)$0.4 ms^{-2}$
   (e) $-0.4 ms^{-2}$

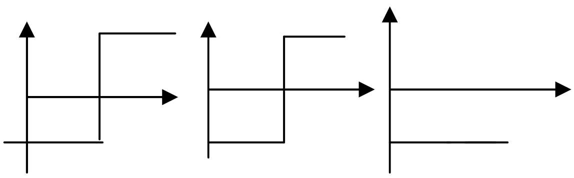
2.



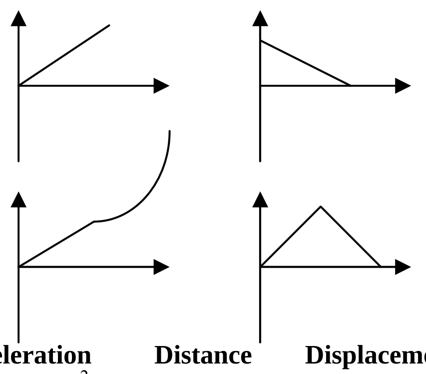
3. (a) Graph (c)
   (b)



4. (a) Graph (c)
   (b) 1.5 s

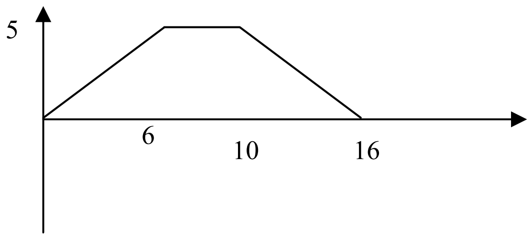


5.

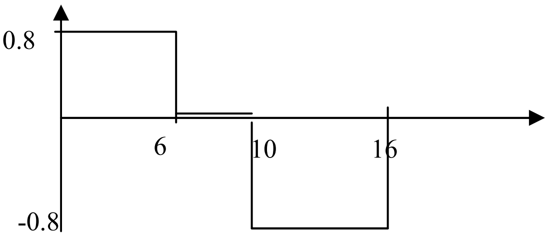


6.**Acceleration**		**Distance**	**Displacement**
(a)	$5.5 ms^{-2}$	275m	displac = distance
(b)	$2.5 ms^{-2}$	5m	displac = distance
(c)	$-7.5 ms^{-2}$	1.33 m	s = -0.79 m

7. (a) $5 ms^{-1}$
   (b) 35 m
   (c) $1.25 ms^{-2}$
8. (a) 3 s
   (b) 45 m
   (c) 30 m
9. (a)

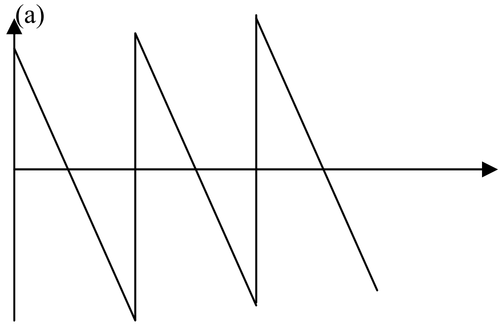


b)

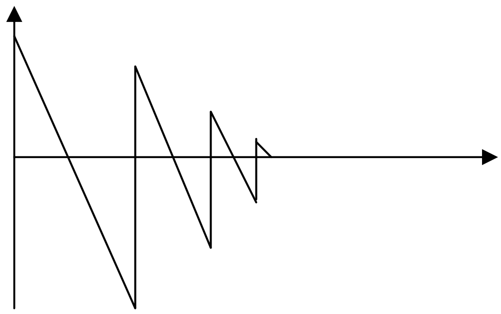


(c) 35 m

10. (a) $-0.75 ms^{-2}$
    (b) $1.0 ms^{-1}$
    (c) 30 m
    (d) $2.7 ms^{-1}$
11.
12. (a)

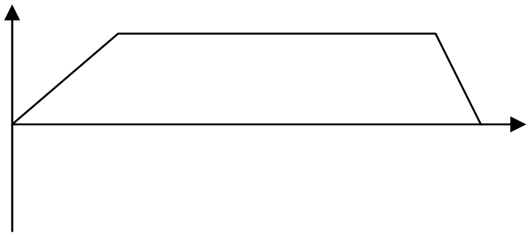


(b)



13. $- 2ms^{-2}$
14. (a) $5ms^{-2}$
    (b) 64m
15. (a) stage 2
    (b) (i) stage 4
    (ii) stage 3
    (c) stage 2
    (d) $0.33ms^{-2}$

16. (a)



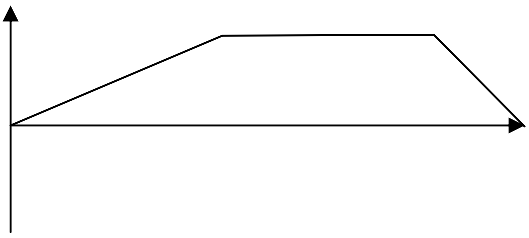
(b) acceleration = constant

(c) $6ms^{-1}$

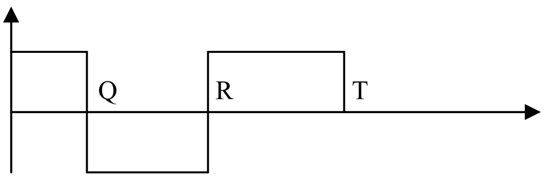
(d)

(e) accelartaion takes time to happen, does not happen instantaneously

(f)



17. P=lift off
Q=engine cuts out
Q-R = slowing down, still travelling upwards
R = reaches highest point, stops, changes direction
R-S = speed up, travels back towards surface of planet
ST = hits surface of planet

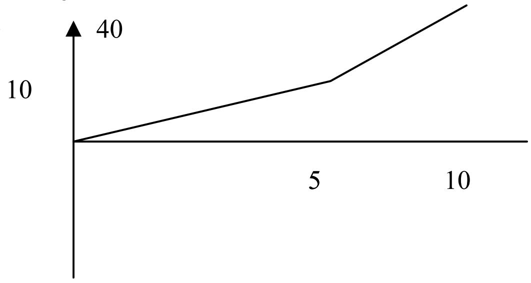


(c) $4ms^{-2}$

18. no

19. no

19.



Past exam paper Questions: Graphs of Motion
Page: 22—28
Questions 1 - 11

1. D
2. A
3. C
4. A
5. E
6. B
7. C
8. B
9. B

10.a. The bungee rope is at its maximum length at 3.6s. At this time the sign ofthe velocity of the bungee jumper changes, indicating a change in their direction from down to up.

b. To calculate the unbalanced force acting on the jumper, the jumper's acceleration must be calculated and then Newtons second law of motion applied.

u = -18m/s   a = (v-u)/t
v = 16m/s   a = (16--18)/3
t = 3s   a = 34/3
a = ?   a = 11.33m/s^2
F = ma
F = 55x11.33
F = 623.3N

c. An elastic rope must be used to ensure the change in velocity does not take place over a very short time interval. If the time interval was short the acceleration of the jumper and hence the unbalanced force acting on the jumper would be much greater. This force could be large enough to injure the jumper.

11.a. i. Initial displacement(s_1) from sensor = 0.2m

ii. Final displacement(s_2) from sensor = 1.8m
$\Delta s = s_2 - s_1$
Δs = 1.8 - 0.2
Δs = 1.6m

iii. s = 1.6   s = ut + ½(at_2)
u = 0m/s   s = (at^2)/2
t = 0.6s   a = 2s/t^2
a = ?   a = 2x1.6/0.6^2
a = 3.2/0.36
a = 8.9m/s^2 (as required)

b. i. Mean = total/N
Mean(a) = (8.9+9.1+8.4+8.5+9.0)/5
Mean(a) = (43.9)/5
Mean(a) = 8.78m/s^2

ii. Random error = (max-min)/N
Random error(a) = (9.1-8.4)/5
Random error(a) = (9.1-8.4)/5
Random error(a) = (0.7)/5
Random error(a) = 0.14m/s^2
a = (8.8+-0.1)m/s^2

NB: It is only useful to quote the final mean and error to the same number of decimal places as the least accurate individual measurement.

i. The contact time is greater with the softer surface.

ii. The rebound height will be less because the sponge will absorb more of the balls kinetic energy. The reduced rebound height can also be explained as a result of the average upward force exerted by the sponge on the ball being less.

iii. As the ball will sink more into the sponge the maximum displacement from the sensor will be greater.

Equations of Motion
Pages 29 to 30
Questions: 1- 22

1. 30 ms^{-1}
2. -11 m
3. -60 ms^{-2}, 33000 m
4. -44 ms^{-1}
5. -5 ms^{-2}
6. 500 ms^{-2}
7. -2.5 ms^{-2}
8. 5.7 s
9. (a) 5000 ms^{-1}
   (b) 1.1 x 10^6 m
10. (a) -88 ms^{-1}
    (b) 397 m
11. (a) -31 ms^{-1}
    (b) 50 m

12 22 ms^{-1}

13 3 s and 1 s

14 (a) -37 ms^{-1}
   (b) 2.2 s

15. (a) 0
    (b) 8.2 s
    (c) 326 m
    (d) 8.2 m
16. (a) 300 m
    (b) 60 ms^{-1}
17. (a) 0
    (b) 19.6 ms^{-1}
    (c) 0
    (d) 19.6 m
    (e) 0
18. 234 m
19. (a) -39 ms^{-1}
    (b) 73 m
    (c) 78 m
    (d) 123 m
20. (a) 6.0 ms^{-2}
    (b) 19 ms^{-1}
    (c) 3.3 s
21. (a) -1.02 ms^{-1}
    (b) 2.98 ms^{-1}
22. (a) 0
    (b) 7.1 s
    (d) 20.4 m
    (e) 107 m

Past exam paper Questions: Equations of Motion
Page: 29 - 33
Questions: 1 - 10

1. E
2. A
3. A
4. B
5. D
6. E

7.a. 7m/s

b. The maximum height reached is calculated using:
$v^2=u^2 + 2as$ OR $s=(v^2-u^2)/2a$
Note that it is the vertical components of motion that are being considered in this equation and that at the maximum height the vertical component of the velocity is zero, reducing the above equation to:
$s=-u^2/2a$
With increasing θ $u_{vertical}$ is increased. Thus the vertical displacement (height), calculated using the above equation, is increased.

8. (a) (i) $7.86ms^{-1}$
(ii) $5.86ms^{-1}$
(b) (i) 1.74m
(ii) ±0.01m

9. Squaring the equation v = at gives:
$v^2 = a^2t^2$ equation 1
The equation $s = 1/2(at^2)$ can be rearranged to give: $t^2 = 2s/a$ which can be substituted into equation1
$v^2 = a^2(2s/a)$
=> $v^2 = 2as$

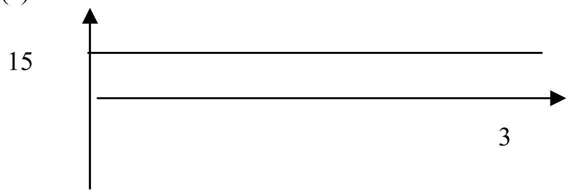
10.a. i. s = 98m
ii. 11.6m/s
iii. 320m

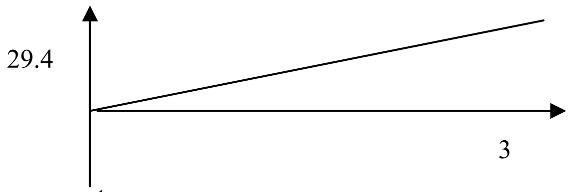
b.i. length of the card(d);
time it takes the trolley to travel from the first light gate to the second(t_1).
The computer must measure the time the card cuts the light beam produced by the light gate at:the top of the slope(t_2);the bottom of the slope(t_3).

b.ii. The speed at the top of the slope(u) is calculated using:
$u=d/t_2$
The speed at the bottom of the slope(v) is calculated using:
$v=d/t_3$
The acceleration is calculated using:
$a=(v-u)/t_1$

Projectiles
Pages 34 –40
Questions: 1 – 18

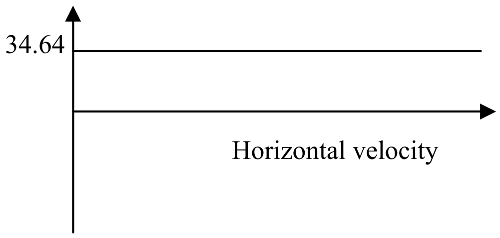
1. (a) 5 s
(b) 123 m
2. (a) $20 ms^{-1}$
(b) $31.6 ms^{-1}$@ 51° to horizontal
3. 271 m
4. (a) 7.3 m
(b) 50 m
5. 5 (+0.6 m)
6 (a) 140 m
(b) 5 m
(c) $40.3 ms^{-1}$ @ 30° to horizontal
7. (a) 2.6 s
(b) 64 m
(c) $36 ms^{-1}$ @ 46° to horizontal
8. (a) vert= $25ms^{-1}$, horz=$40ms^{-1}$
(b) horizontal
(c) $0ms^{-1}$

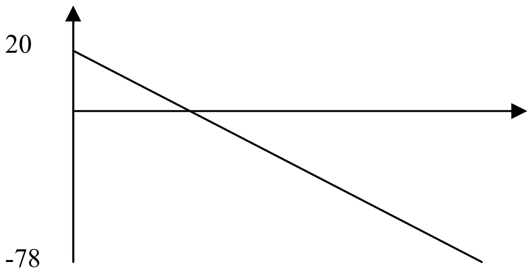
9.a i)


ii)


(b) $26.84ms^{-1}$@52.57° South of east
10. (a) (i) constant
(ii) decreases to zero, then increases
(b) $50ms^{-1}$@36.87° to the horizontal
(c) $0ms^{-1}$
(d) 44.1m
(e) 240m
11. (a) 0.5km / $0.5x10^3$m / 500m
(b) 20.2s
(c) 10101.5m = 10.1km
(d) same time as g = constant
(e) horiz: $5000ms^{-2}$, vert: $9.8ms^{-2}$
(f) 13.09m
12. (a) $20ms^{-1}$
(b) 20.41m
(c) 4.08s
(d) 106m
13. (a) 8s
(b) 379.2m
14. (a) $80ms^{-1}$
(b) 7.07s
(c) 244.9m
(d) 282.8m
15. (a) 7.82s
(b) 2347.38m
(c) directly above

16. (a) 5s
(b) 122.5m
17. (a)





(b) 290m
(c) 85.34ms^{-1}@ 156.05^{o}

18. (a) 12ms^{-1}
(b) 1.18m

Past exam Questions: Projectiles
Page: 41 - 44
Question: 1– 17

1. D
2. D
3. C
4. s_{ver} = -0.441m
5. a. (i) 33.74m/s
(ii) 24.5m/s
c. 151.8m/s
6. .a .i. 3.5(m/s)
ii. 6.06(m/s)
b. The horizontal velocity throughout is constant. This fact can be used to calculate the time to reach the dish.
c. s_{ver} = 1.71m
d. The kinetic energy of the projectile as it enters the dish must, be less than that when it leaves the contestants hand.
7 .a. i. 26.81m/s
ii. 22.5m/s
iii. t = 2.29s
b. d = 135.66m

Revision of Force, Work and Energy
Page 40 - 41
Questions 1 - 17

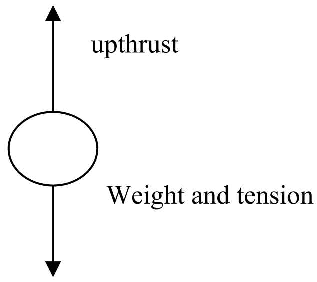
1. 8820 N
2. 686 N
3. 66 kg
4. 825 N
5. 1600 N
6. As f=ma, and as m increases a will decrease
7. (a) 4 N to the left
(b) -2 ms^{-2}
8. (a) 80 J
(b) 16 W
9. 30 m, 40 W
10. 40 m, 2.4 s
11. (a) 98 J
(b) 98 J
(c) 16 J
(d) 2.5 ms^{-1}
12. 32 m
13. 8823.53^{o}C
14. (a) 2 J
(b) 2 J
(c) 1.4 ms^{-1}
15. (a) 14.7 J
(b) 9.4 J
(c) 5.3 J
(d) 5.3 J
(e) 2.7 N
16. (a) -495 ms^{-2}
(b) 2.5 x 10^{8} J
17. (b) 10 m
(c) 0.9 ms^{-1}

Past exam paper questions: Energy
Page 42
Questions 1

1. D

Force & Acceleration
Page 43 - 45
Questions 1 - 13

1. (a)



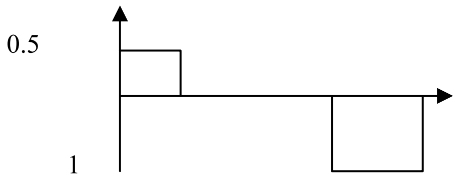
(b) Forces initially balanced, Tension re moved, upthrust is greater than weight

2 (a) thrust = 16000 N
weight = 14700 N
(b) 16000 N
(c) 14700 N
(d) 0.86 ms^{-2}
(e) mass decreases

3.(a) 2 ms^{-2}
(b) 2000 N
(c) Some force used up overcoming friction

4.(a) 2 ms^{-2}
(b) 3 N

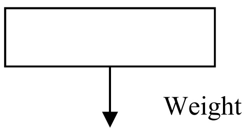
5.



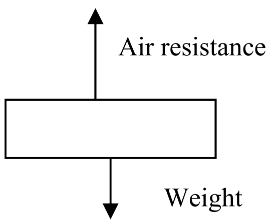
(b) 41.2 N, 39.2 N, 37.2 N

6. (a) 18 N
(b) 12 N

7. (i)



(ii)



8. (a) 4.5 N
(b) 3 N, 4.5 N

9. T1 - 1 N
T2 - 0.8 N
T3 - 0.4 N

10. (a) 5.2 N
(b) 2.5 s

11. (a) 4.14 ms^{-2}
(b) 51.8 m
(c) 20.7 ms^{-1}
(d) 18.7 s

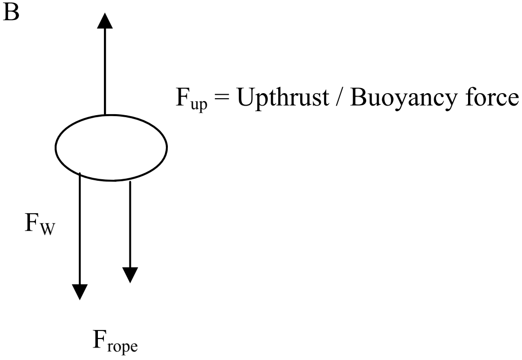
12. (a) 490 N
(b) 590 N
(c) 468 N
(d) 740 N
(e) 340 N

13. (a) 1274 N
(b) 1664 N
(c) 1274 N
(d) 754 N

Past exam paper Questions: Forces
Page 51 - 54
Questions 1 - 13

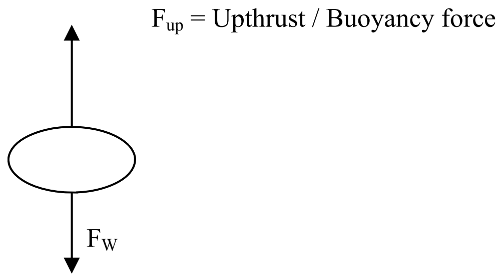
1. C
2. C
3. D
4. A
5. B
6. E
7. C
8. B
9. B

10.a.i.



a.ii. 1250N

b.



The buoyancy force is not dependent on depth. Therefore, the buoyancyforce is as calculated in part a.ii. (1250N).

11. a. Same as 10b.
b. Newton's first law states that: "an object will remain at rest or move with a constant velocity in a straight line unless acted upon by an unbalanced force".This means there are no unbalanced/resultant forces acting on the balloon, as it is at rest.

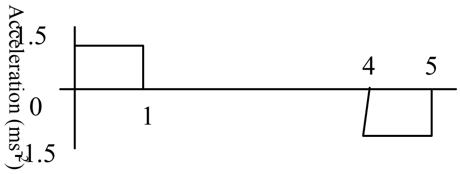
Past exam paper Questions: Forces (cont'd)
Page 55 - 58
Questions 1 - 13

12 .i. 2.7m/s^2
ii. 201.67m

13.. a. The weight of the student is equal to the scale reading when the lift is moving at a steady speed. This weight is used to calculate the mass of the student.

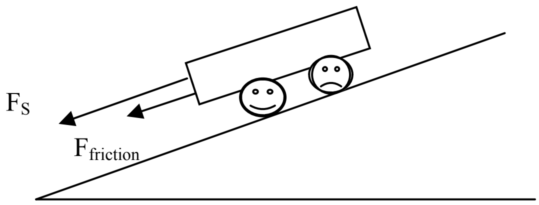
$F_w = mg$
$m = F_w/g$
$m = 588/9.8$
$m = 60kg$

b. 1.5m/s^2
c. -1.5m/s^2
d.



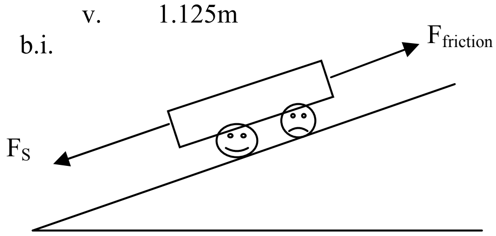
Past exam paper Forces on a slope
Page 55 - 57
Questions 1 - 5

1. C
2. D
3. B
4. (a) (i) 136.8N
(ii) 2.86ms^{-2}
(b) no effect
(c) friction = parallel component of weight
5. .a. i. 6.7N
.ii.



. iv. t = 0.75s
v. 1.125m

b.i.



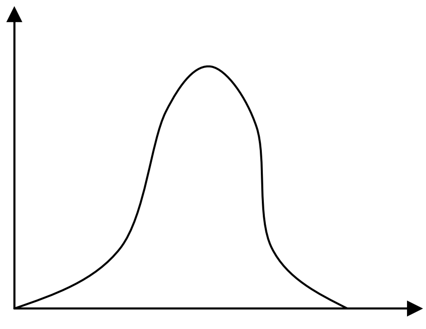
b.ii. The force vectors in the above diagram are acting in opposite directions. This will produce a smaller unbalanced force than that calculated in part a.iii. This meansthat the magnitude of the acceleration will be less when the trolley moves down the slope.

Momentum
Pages 58 – 60
Question 1 - 19

1. 6 kgms-1
2. 6 ms^{-1}
3. 1.4 ms^{-1}
4. 44.3 kg
5. 3 ms^{-1}in original direction
6. 2.4 ms-1 in original direction
7. 0
8. 3 ms^{-1}in original direction
9. 1.5 ms-$^{-1}$ in original direction of the 5 ms-1 trolley
10. 10 ms^{-1}in original direction
11. 7 ms^{-1}to the left
12. 5 ms^{-1}in opposite direction
13. 397 ms-1
14. (a) (i) elastic
(b) (iii) inelastic
15.(a) 6.3 ms^{-1}in original direction, 14.2 J
(b) 0.6 ms^{-1}to right, 289.7 J
16. (a) 6.9 ms^{-1}to right, 24.2 J
(b) 0.63 ms^{-1}to right, 290 J
17. (a) 5 ms-2
(b) 20 ms^{-1}
(c) 30 ms^{-1}
18. 0.61 ms-1 to left
19. (a) 25 ms^{-1}
(b) 156250 J
(c) 31.9 m

Past exam paper Momentum
Page 61 - 66
Questions 1 - 10

1. B
2.
3. C
4. B
5. 12ms^{-1}
6. (a) -
(b) -0.12kgms^{-1}
(c) (i) 2N



7. (a) (i) 4.91ms^{-1}
(b) (i) 5000N
(ii) 10MPa
(iii) As time of contact increased, therefore average force decreased, therefore pressure to head also decreased.

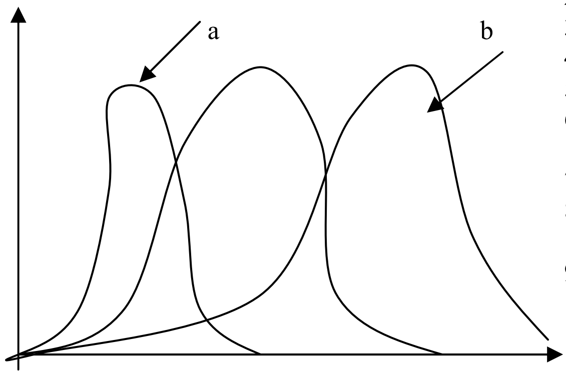
8. (a) Total momentum before P_{before} = Total momentum after P_{after}
(b) (ii) If kinetic energy is conserved the collision is elastic, and if it is notthe collision is inelastic.
9. (a) $-0.3ms^{-1}$
(b) (i) probe rocket engine = on
(ii) 1.6s

(c)The initial acceleration to the RHS must be produced by the space vehicle rocket engine. To then decelerate the combined mass of the probe and vehicle the space probe rocket engine must fire. In the maneuver the space probe rocket must fire for twice the time of the vehicle rocket because it only produces half the thrust.

Mathematically:
Fprobetprobe = Fvehicletvehicle
500tprobe=1000tvehicle
tprobe = 2tvehicl

10. (a) $91.2kgms^{-1}$
(b) 0.7s
(c) $0.51ms^{-1}$
(d) not elastic

Impulse
Pages 67 - 68
Questions 1 - 14



2. 50 Ns
3. 15000 N
4. (a) 1 Ns
(b) -20 N
5. 1900 N, -38000 N, -19000 Ns
6. 5 s
7. 100 N
8. -3 Ns, -200 N
9. 375 N, 7.5 Ns
10. 5000 N
11. 8000 N
12. 25.5 N
13. (a) 1.5 kg ms-1
(b) 1.5 Ns
(c) 37.5 N
(d) 75 N
14. (a) see Qu 1
(b) as average force is less due to time of collision being increased

Past exam paper Questions: Impulse
Pages 69– 73
Questions 1 - 7

1. A
2. C
3. A
4. C
5. C
6. (a) (i) 0.4m/s
(ii) 3.6N
(b) (i)
(ii) (3.6± 0.72)N
7. (a) (i) -6.26m/s
(ii) -4695N

(b) The thick layer of soft material will increase the time over which the momentum changes. As the change in momentum is the same, the average unbalanced force must be less.

(c) Block X will cause more damage because the force, although the same foreach block, is exerted over a smaller area. This results in more pressureapplied to the pipe.

Pressure = Force/Area

Density
Page 73
Questions 1-11

1. 8000 kg m^{-3}
2. 6750 kg
3. 0.8 m^3
4. 0.3 m
5. 780 kg
6. (a) 0.35 m^3
(b) 0.95 kg m^{-3}
7. 10 cm^3
8. (a) 1320 kg m^{-3}
(b) 7.7 x 10-5 m^3
9. 10 m^3
10. increases by a factor of 10
11. see summary

Past exam paper Questions: Density
Page 74
Questions 1-4

1. E
2. C
3. C
4. A

pressure

Page 75

Questions 1-12

1. Constant force (weight), area increases therefore pressure decreases.
2. 60 Pa
3. 1×10^6 N
4. 8000 Pa
5. 400,000 Pa
6. 1.5 x 108 Pa
7. 300 N
8. 0.04 m^3
9. 32.7 kPa
10. max P = 7840 Pa
    min P = 4700 Pa
11. 73500 Pa
12. Crawl, as this increases the surface area, therefore reduces pressure on the ice.

Pressure in liquids

Page 76 - 77

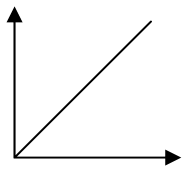
Questions 1-8

1. 98 000 Pa
2. 114700 Pa
   0
3. 294 000 Pa
4. (a) 1568 Pa
   (b) 2350 Pa
   (c) (i) 22.6 N
   (ii) 33.8 N
   (d) 11.2 N upwards
5. (a) 490 N
   (b) 490 N
   (c) 0.075 m^3
6. (a) 3.2×10^4 Pa
   (b) 9.25 m
7. (a) 4.3×10^3 Pa
   (b) 833 kg m^{-3}
9. (a) Upthrust caused by pressure on top of detector being less than the pressure from the water at the bottom of the detector.
   (c) 30912 N

Past exam paper Questions: Pressure Page 78 - 80

Questions 1-5

1. D
2. B
3. E



4. (a) 3.83×10^{-3}kg
   (b) (i) 2100N
   (ii) 1.5×10^5Pa
5. (a) (ii) 2450N

(iii) As the depth increases the total pressure acting on the air inside the tubing increases. Liquid enters the tube,compressing the air, until the total pressure acting on the air inside the tube is equal to the pressure of the air inside the tube.

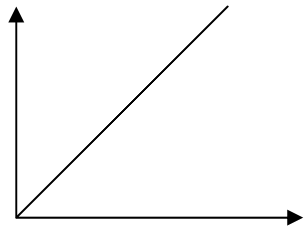
(b) 1.108×10^5Pa

Past exam paper Questions: Upthrust and Pressure in liquids

Page 81 - 83

Questions 1-4

1. E
2. D
3. (a)



(b) (i) The lower surface area of the submarine will experience a greater pressure than the top surface because it is a greater depth below the surface. This pressure difference means that there will also be a greater force exerted on the lower surface than the top surface as the force(F) on each surface is equal to the product of the pressure(p) and area(A).

Fupthrust = Fbottom - Ftop

(ii) 14790kg

(iii) The effective mass of the submarine is decreased when water in the tanks is replaced with air, however, the upthrust force does not change. Therefore, as the acceleration is calculated using newtons second law, a = Fupthrust/m, the acceleration increases as mass decreases

4. (a)
   (b) 1176N
   (c) As the density of sea water is greater than that of fresh water, the additional pressure, due to the fluid, acting on the lower surface will increase. This will increase the upthrust.

Pressure and Volume (constant Temperature)

Page 84 -85

Questions 1- 9

1. 2×10^5 Pa, 5×10^5 Pa
2. 375 cm^3
3. 118 m^3
4. 25 kPa
5. 4 x 105 Pa
6. (a) 3×10^5 Pa
   (b) 2×10^5 Pa
7. (a) 3.84 m^3
   (b) 12.8 mins
8. 1.025×10^5 Pa,
   3.075×10^5 Pa, 164 kg
9. (a) 9 l (900 l)
   (b) 21.6 s (36 mins)

Pressure and Temperature (constant Volume) Page 86

1.(a)(i)0 K
(ii) 123 K
(iii) 223 K
(iv) 273 K
(v) 300 K
(vi) 423 K
(vii) 573 K
(b) (i) -273 ^{o}C
(ii) -250 ^{o}C
(iii) -173 ^{o}C
(iv) 20 ^{o}C
(v) 77 ^{o}C
(vi) 100 ^{o}C
(vii) 227 ^{o}C

2. 331 K (58 ^{o}C)
More often & harder collisions as molecules are moving faster
3. 2.7×10^6 Pa
4. 4.6×10^4 Pa
5. 1200 K (927 ^{o}C)

Temperature & Volume (constant Pressure) Page 87

1. 300 K (27 ^{o}C)
2. 0.12 cm ^{3}
3. Absolute (Kelvin) temperature does not double.

General Gas Equation Page 88 - 95

1. (a) 200 kPa
(b) 600 K (327 ^{o}C)
2. (a) 500 kPa More collisions with sides in unit time asthere is less distance between sides.
(b) 836 kPa
3. 5.07×10^5 Pa
4. (a) increase x4
(b) no change
(c) increase x12
5. (a) increase x4
(b) no change
(c) increase x12
6. V decreases, so less time between collisions, therefore more in unit time.
T increases, so molecules move faster therefore more and harder collisions in unit time.
T decreases, so molecules move slower, so V must decrease to maintain constant P.

Past exam questions: Gas laws
Page 89 - 85

1. D
2. A
3. B
4. A
5. D
6. E
7. C
8. D
9. 0.05m^3
10. (a) The assumption in this experiment is that the gas in the container is the same as the water temperature. To facilitate this the can must be fully immersed to allow the gas and water temperature to equilibrate.
(b) 120kPa
(c) 120N
(d) The mass and the volume of gas are fixed in this experiment, therefore, the density (mass/ volume) must also remain constant.
11. a. (i) 0.0026, 0.0027, 0.0027, 0.0022, 0.0025
(ii)(0.0026+-0.0001)kg
(iii) 1.29 kg/m^3
(iv) flask of larger volume is better because this increases the mass and volume of air and used in the experiment. This should result in a smaller percentage error in the measurements of both mass and volume of the gas. This will in turn reduce the percentage error in the calculated density of air.
12. (a) 120.35kPa
(b) As the temperature increases the nitrogen gas molecules gain kinetic energy. With increased kinetic energy the atoms are moving faster and collide with the container walls more frequently and forcefully. The pressure (force/area) therefore increases
(c) (i) 0.7N
(ii) 35mm
(d) The assumption in the original set up is that the temperatureof the water is the same as the temperature of the gas inside the flask. Placing the thermometer inside the flask will give a more direct and accurate reading of the gas temperature.