10E physics (NOM)
Revision of Autumn 2017

Book chapters:
1.01 Numbers and units
1.02 A system of units

2.01 Speed, velocity, acceleration
2.02 Motion graphs
2.04 Free fall
2.05 More motion graphs

2.06 Forces in balance
2.07 Force, mass acceleration
2.08 Friction and breaking
2.09 Force, weight, gravity
2.10 Action and reaction

Tables and formulas provided in the test:

TABLE 1.5 ■ Selected Prefixes Used in the Metric System

Prefix	Abbreviation	Meaning	Example
Giga	G	10^9	1 gigameter (Gm) = 1×10^9 m
Mega	M	10^6	1 megameter (Mm) = 1×10^6 m
Kilo	k	10^3	1 kilometer (km) = 1×10^3 m
Deci	d	10^{-1}	1 decimeter (dm) = 0.1 m
Centi	c	10^{-2}	1 centimeter (cm) = 0.01 m
Milli	m	10^{-3}	1 millimeter (mm) = 0.001 m
Micro	μ[a]	10^{-6}	1 micrometer (μm) = 1×10^{-6} m
Nano	n	10^{-9}	1 nanometer (nm) = 1×10^{-9} m
Pico	p	10^{-12}	1 picometer (pm) = 1×10^{-12} m
Femto	f	10^{-15}	1 femtometer (fm) = 1×10^{-15} m

[a]This is the Greek letter mu (pronounced "mew").

$v_{ave} = \frac{s}{t}$	$a = \frac{\Delta v}{t}$ $v = u + at$ $s = ut + \frac{1}{2}at^2$ $s = \frac{v^2 - u^2}{2a}$	$F = ma$ $W = mg$ $F_\mu = \mu N$

Practice problems:

1. Complete the table

Quantity	Symbol	Unit	Symbol
Displacement	s	meter	m
Time	t	second	s
Initial velocity	u	meters per second	$m\ s^{-1}$
Final velocity	v	meters per second	$m\ s^{-1}$
Acceleration	a	meters per second sqared	$m\ s^{-2}$
Force	F	Newton	N

2. Complete the table

Number	With prefix	With power of 10
1234 m	1.234 km	$1.234 \cdot 10^{3}$ m
0.000 056 s	56 µs	$5.6 \cdot 10^{-5}$ s
780 000 000 N	780 MN	$7.8 \cdot 10^{8}$ N
0.009 J	9 mJ	$9 \cdot 10^{-3}$ J

3. Which are the basic units of the SI system?

   meter, second, kilogram, (Ampere, Kelvin, mole, candela)

4. A car drives 180 km in 3 h, what is the average speed?

   60 km/h

5. A bicycle moves 1.2 km with 5.7 $m\ s^{-1}$. How long does it take?

   210 s

6. A snail moves at 0.0082 $m\ s^{-1}$. What distance does it move in 15 min?

   7.4 m

7. What does uniform motion mean?

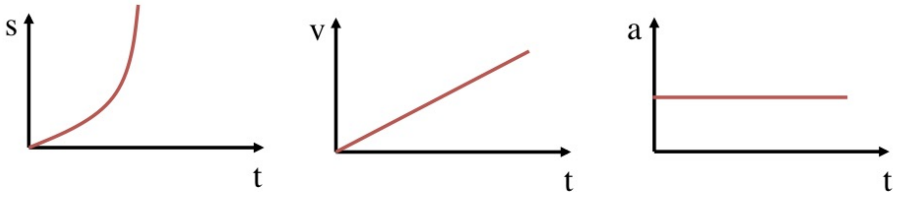
   Constant velocity

8. Sketch the three typical graphs for uniform motion

9. What does uniformly accelerated motion mean?

   Constant acceleration

10. Sketch the three typical graphs for uniformly accelerated motion



11. Sketch a graph representing the motion of a squirrel climbing up a tree, eating a nut and climbing back down

    …

12. A car does 0 to 100 km/h in 6.5 s, what is the acceleration?

    4.3 m s^{-2}

13. An airplane starting from rest needs to reach 56 m s^{-1} to be able to take off. The average acceleration is 3.2 m s^{-2}. How long must the runway be?

    490 m

14. A stone is dropped from a 20 m high tower. How long does it take to reach the ground?

    2.0 s

15. Sketch a graph representing the motion of a parashoot jumper jumping from a plane.

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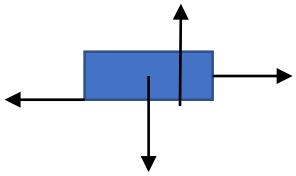
16. Sketch a free body diagram of a bicycle moving at constant speed along a straight road.



17. A net force of 30 N is applied to a box of mass 53 kg. What is the acceleration?

    0.57 m s^{-2}

18. What is the difference between mass and weight?

    Mass is the same everywhere, weight depends on the planet.

19. What is the weight of a person with a mass of 65 kg close to earth?

    640 N

20. Why do astronauts on the ISS seem weightless?

    They are in free fall around the Earth

21. What does static friction and kinetic friction mean?

    The static friction is what must be exceeded to get something moving. Once it is moving you need less force to keep it moving since kinetic friction is always smaller than static friction.

22. State the three laws of Newton.

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