Flash Card **Answers**

1. The gravitational field strength on Earth is 9.8N/kg.
   Fred has a mass of 70kg. What is his weight?
   9.8N/kg × 70kg = 686N

   Fred travels to the Moon. On the Moon his weight is 112 N.
   What is the gravitational field strength on the Moon?
   112N ÷ 70kg = 1.6N/kg

2. Monika lifts a book from the floor onto a shelf. The shelf is 6m high and the book has a weight of 8N. How much work did Monika do when lifting the book?
   8N × 6m = 48J

   Monika lifted a second box onto the shelf. The work done was 126J. How much did the second box weigh?
   126J ÷ 6m = 21N

3. A block is attached to a spring, causing the spring to extend by 5cm.
   How many metres does the spring extend?
   0.05m

   The spring constant of the spring is 104N/m.
   How much force did the block apply to the spring?
   104N/m × 0.05m = 5.2N

   A new block with a weight of 7.8N is placed on the spring.
   What is the new extension of the spring?
   7.8N ÷ 104N/m = 0.075m or 7.5cm

4. Ibrahim has a weight of 372N. He sits 2.4m from the centre of a see-saw.
   Calculate the moment.
   520.8Nm

   His younger brother, Sami, has a weight of 217N.
   How far does Sami need to sit from the centre to balance the see-saw?
   520.8Nm ÷ 217 = 2.4m

5. Lorna has a weight of 685.8N. She walks on the snow with boots that have an area of 0.06m2.
   How much pressure does Lorna exert on the snow?
   685.8N ÷ 0.06m² = 11 430Pa

   Lorna puts on skis. She now exerts a pressure of 1040Pa on the snow.
   What is the surface area of her skis?
   685.8N ÷ 1040Pa = 0.66m² to 2d.p.

6. A bus is travelling at 13.4m/s for 2 minutes between stops.
   How far apart are the bus stops?
   2 minutes = 120 seconds
   13.4m/s × 120s = 1608m

   The bus reaches the end of the line and drives directly back to the bus station without stopping. The bus travels 24 120 metres at 13.4m/s.
   How long does it take to get back to the station?
   24 120 ÷ 13.4m/s = 1800s or 30 minutes

7. A car was travelling at 13.4m/s. When it left a village, it sped up to 24.6m/s which took 4s. What was the acceleration of the car?
   Change in velocity = 24.6m/s - 13.4m/s = 11.2m/s
   11.2m/s ÷ 4s = 2.8m/s^2

   The driver brakes for 2s, the car's deceleration was -5.4 m/s^2.
   What was the final velocity of the car?
   Change in velocity = 5.4 m/s^2 × 2s = 10.8m/s
   Final velocity = 24.6m/s - 10.8m/s = 13.8m/s.

8. A train has a mass of 250000kg. It accelerates at 0.25m/s^2. calculate the force of the engine.
   250 000kg × 0.25m/s^2 = 62 500N

   At the next station, two carriages are removed from the end of the train. The train now has a mass of 201050kg. If the engine produces the same force, how much will the train now accelerate?
   62 500N ÷ 201 050kg = 0.31m/s^2 to 2d.p.

9. A leopard with a mass of 56kg walks through grasslands with a velocity of 1.8m/s. What is the leopard's momentum?
   56kg × 1.8m/s = 100.8kg m/s

   The leopard sprints after a deer, its momentum is 716.8kg m/s. What is the velocity of the leopard?
   716.8 kg m/s ÷ 56kg = 12.8m/s

10. A 0.4kg football is kicked from the penalty spot at a speed of 31m/s. How much kinetic energy does the ball have?
    (31m/s)^2 = 961m/s
    0.5 × 0.4kg × 961m/s = 192.2J

    The goalkeeper saves the penalty and the ball bounces out of their hands. The ball has 103J of kinetic energy. How fast is it travelling?

    $$\frac{103J}{0.5 \times 0.4kg} = 515$$

    √515 = 22.7m/s to 1d.p.

11. A 71kg bungee jumper is preparing to jump from a height of 83m. The gravitational field strength on Earth is 9.8N/kg. How much gravitational potential energy does the jumper have?
    71kg × 9.8N/kg × 83m = 57751.4J

    The person jumps! Once the bungee cord has fully extended, they rebound. At the highest point they reach they have 34650J of gravitational potential energy. How high did they rebound?

    $$\frac{34\,650J}{71kg \times 9.8N/kg} = 49.8m \text{ to 1d.p.}$$

12. A microwaveable burger requires 180000J of energy to cook. The cooking time is 4 minutes.
    4 minutes = 240 seconds

    What is the power of the microwave?
    180000J ÷ 240s = 750W

Ralph's microwave has a power output of 900W. How long will he need to cook the burger for?
180000J ÷ 900W = 200s

13. A car engine does 4200kJ of work in 70s. What is the power of the engine?
4200kJ = 4200000J
4200kJ ÷ 70s = 60000W

A sports car engine has a power of 83000W. How much work can it do over the same time?
83000W × 70s = 5810000J or 5810kJ

14. A disco ball uses 300J of energy, 50J of energy is transferred as light. How efficient is the disco ball?

$$\frac{50J}{300J} = 0.17 \times 100 = 17\% \text{ to 2d.p.}$$

If it uses 200J of energy, how much is transferred as light?
200J × 0.6 = 120J

15. A sound wave has a frequency of 500Hz and a wavelength of 0.32m. How fast is the wave travelling?
500Hz × 0.32m = 160m/s

A water wave travels with a speed of 23m/s. If it has a wavelength of 60m, what is the frequency of the wave?
23m/s ÷ 60m = 0.38Hz to 2 d.p.

16. A current of 10A flows for 30s. How much electrical charge has been moved in the circuit?
10A × 30s = 300C

420C of charge were moved over 20 seconds. What was the current?
420C ÷ 20s = 21A

17. A current of 1.2A flows through a 150Ω resistor. What is the potential difference across the resistor?
1.2A × 150Ω = 180V

A current of 3A flows through a 240V bulb. What is the resistance of the bulb?
240V ÷ 3A = 80Ω

18. The potential difference across a lightbulb is 12V. The current that flows through the bulb is 0.4A. Calculate the power of the bulb.
12V × 0.4A = 4.8W

A bulb with 6W of power has a current of 0.8A flowing through it. What is the potential difference across the bulb?
6W ÷ 0.8A = 7.5V

19. A motor in a circuit has a resistance of 250Ω. What is the power of the motor when a current of 1.2A flows through it?
250Ω × 1.2^2A = 360W

The current in the circuit increases. The 250Ω motor now has 1000W power. What is the new current?
1000W ÷250Ω = 4A
√4A = 2A

20. A microwave uses 1100W of power over 2 minutes. How much energy is transferred?
2 minutes = 120 seconds **1100W × 120s = 132 000J**

Eva uses the 1100W microwave to cook scrambled eggs. The microwave transfers 99 000J of energy during the cooking time. How long does it take to cook the scrambled eggs?

99 000J ÷ 1100W = 90s

21. When connected to a potential difference of 15V, a charge of 0.5C passes through a buzzer. How much energy is transferred to the buzzer?
15V × 0.5C = 7.5J

A charge of 2C transfers 240J of energy. What is the potential difference?
240J ÷ 2C = 120V

22. A rock has a mass of 16kg and a volume of $0.01m^3$. What is the density of the rock?
16kg ÷ 0.01 m^3 = 1600 kg/m^3

A piece of gold has a density of 19300 kg/m^3 and a mass of 19.3kg. What is the volume of the piece of gold?
19.3kg ÷ 19300 kg/m^3 = 0.001m^3