

TUNNELWORKS

KS4 SCIENCE LESSON 3 WORKSHEET

SHAFTS

Task 1: What energy changes take place as the crane lifts a skip of waste materials?

- Discuss what forms of energy the skip has before, during and after the crane lifts it to the surface.
- Write these forms of energy in the left-hand boxes below.

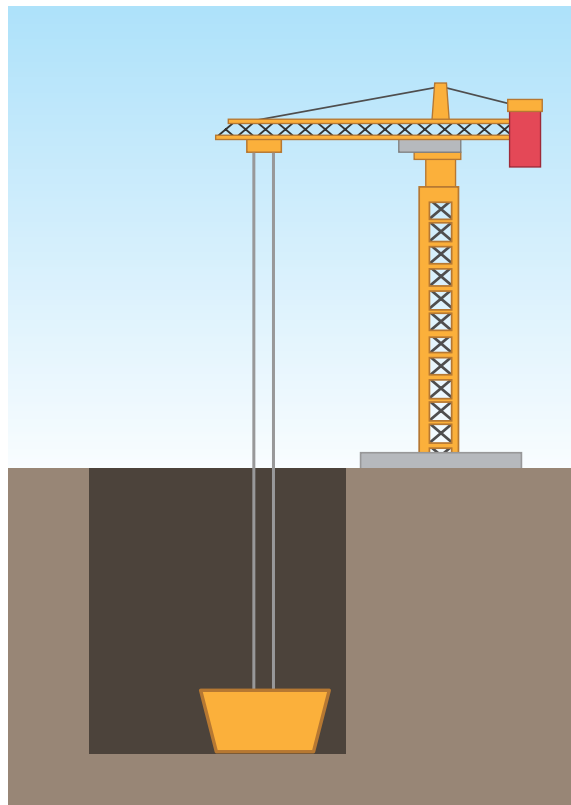
Task 2: What work does the crane do to lift the skip of waste to the surface?

- Work is done when a force moves. Discuss how you could represent this with an equation.
- Label the diagram and write the equation in the right-hand box below.

At the surface:

Whilst moving:

At the bottom:



Label the diagram to show the force on the skip and the work done.

The equation for work done is:

Task 3: How much work is done when a crane lifts skips of waste materials?

- At sites along the River Thames the shafts will be different depths. How much work is done at each location? Complete the missing cells in the table below. (Use $g = 10\text{N/kg}$)

Location	Shaft depth (m)	Skip mass (kg)	Work done (J)
A	10	5000	
B	15	4000	
C	25	3500	
D		4000	880,000
E	18		990,000

Task 4: What is the power of each crane?

- The table below shows the time taken for the cranes above to raise a skip from the base of the shaft to the surface. Complete the missing cells to the nearest whole number. You will need to use some of your answers for task 3.

Location	Time (s)	Power (W)
A	30	
B	40	
C	44	
D		17,500
E		22,000