Bilton School Sixth Form

Physics – Transition Work

To prepare effectively for Physics you should work through the below tasks and bring these with you for your first day at Bilton sixth form.

Please note you will sit a baseline assessment related to the materials below (TASKS1, 2, 3, 4 & 5) when you commence sixth form.

Task 1— **Force and Motion**

A) Describe the terms speed, velocity, time, displacement. Show on a diagram a circular object moving 12M on a bearing of 270^{o} (scale = 1cm to 2M)

B) Define the term vector and the term resultant vector. Show on a diagram the resultant vector of an object travelling 10 M due east, and then 6M at a bearing of 60^{o}

C) Remind yourself of and summarise Pythagoras theorem, then apply this theorem to your previous worked example.

D) Initial velocity = 1m/s west and final velocity of 3.0 m/s north, calculate resultant.

E) A hot air balloon descends at a velocity of 5.9m/s at an angle of 23^{O} to the horizontal. How long does it take the balloon to descend?

F) A train has an initial velocity of 12.8m/s to the left. After 22.0 seconds it is moving to the right at 18.3 m/s. What was the average acceleration during this time?

G) An Apple falls from a tree and hits the ground at 4.9 meters per second for how long was it falling?

H) A metal rod falls from a stationary helicopter. What velocity does it hit the ground at 10 seconds later?

I) Sketch separate displacement time graphs for a car in each of the following situations:

travelling away from the observer at constant velocity

travelling away from the observer and slowing down

not moving a short distance from the observer

accelerating towards the observer

J) The engine of a plane provides the force at 920 newtons at an angle of 12 degrees above the horizontal. What is the horizontal component in the force?

K) A kite surfer is pulled along the beach by a force of 150 newtons as an angle of 78 degrees above the horizontal. What is the vertical component of the force?

L) An Apple of mass 0.120 kg falls with an acceleration of 9.81 metres per second squared. What is the gravitational force pulling it down? e.g. its weight)

M) Ship has kinetic energy equal to 5.4x10 ^{7} joules when moving at 15 metres per second. What is it mass?

N) A crate is raised through 7 meters and gains 1715 joules of gravitational potential energy. What is the mass of the crate?

O) A book of mass 0.475 kg falls off a tabletop 92 centimetres from the floor. What speed is it travelling up when it hits the floor?

P) A boy pulls a toy cars 2.5 meters along the ground. He applies a force of 17 newtons at an angle of 35 degrees to the horizontal. How much wood does he do?

Q) If a lift mechanism works at 14 kW, how long does it take to do 91 kilojoules of work?

Task 2 — **Efficiency, Forces and Springs**

A) A motor uses 375 joules of electrical energy and lifting and 12.9-kilogram mass through 2.5 metres. What is its efficiency?

B) It takes 1.4 mega joules of chemical energy from the petrol in a car engine to accelerate a 560-kilogramme car from rest to 25 metres per second on a flat road. what is the gain in kinetic energy? And what is the efficiency of the car?

C) A force applied to the spring with a constant of 60 four point one new to meters causes it to extend by 24.5CM. What was the force applied to the spring?

D) A pile of bricks is hung off a spring with the spring concert at 84 Newton meters. The brick supplier force of 378 newtons on the spring. How much does the spring extend by?

E) What is meant by the limit of proportionality?

F) Why might spring not return to its original length after being stretched and then released?

Task 3—Current and Potential Difference

A) How long does it take to transfer 12 coulombs of charge if the average current is 3 amps?

B) The potential difference across a boom is 1.5 volts. How much work is done to past 9.2 coulombs through the bulb?

C) A motor runs for 275 seconds and does 9540 joules of work. If the current in the circuit is 3.8 amps, what is the potential difference across the motor?

D) If a current of 2.5 amps flows through the component with a resistance of 15 ohms, what is the potential difference across the component?

E) What current will flow through a 2500-ohm resistor if the voltage across it is 6 volts?

F) What is the resistance of a component if 1.5 volts drives a current of 0.024 amps through it?

G) State ohms law

H) sketch current voltage graphs for:

· An ohmic resistor

· a filament lamp

· a diode

I) What is the power output of a component if the current through it is 0.12 amps when the potential difference across it is 6.5 volts?

J) An electric heater has an operating power of 45 Watts. What current passes through the heater when the potential difference across it is 14 volts? How much work does the heater do in 12 seconds?

K) What is the power output of a 2400-ohm component if the current through it is 1.2 amps?

L) A motor has a resistance of 100 ohms. How much work does it do in a minute if it is connected to a 6 Volt power supply?

M) The current through a 6-Watt amp is 0.5 amps, what is the resistance of the lamp?

Task 4—**Atomic structure and radiation**

A) Describe the three particles that make up an Atom

B) State what is meant by the proton number and the nucleon number?

C) State the relative mass and relative charge of proton, neutron, and electron

D) What is an isotope of an element?

E) What is an Alpha particle made up of?

F) Describe what happens during the emission of beta and gamma radiation?

Task 5—Waves

A) Sketch a graph of displacement against time for three complete oscillation of one part of a wave of amplitude 0.05 metres on a time period of 0.8 seconds.

B) A radio wave has a frequency of $6.25 * 10^5$ Hz what is the time period of a radio wave.

C) A sound wave has a time period of 0.0012 seconds. Find the frequency of the sound.

D) A wave along with spring has a frequency of 3.5 Hz and wavelength of 1.4 metres. What is the speed of the wave?

E) A wave has a time period 7.1 seconds and is moving at a speed of 180 meters per second. What is the frequency of the wave? What is the wavelength of the wave?

F) What is meant by superposition?

G) What is meant by constructive interference?

H) What is meant by destructive interference?

I) A wave with an amplitude of 0.67MM is superposed with an identical wave with the same amplitude. The waves are in phase. What is the amplitude of the superposed wave?

J) Two waves colour both an amplitude of 19.1 meters, are exactly out of phase. What is the amplitude of the single wave formed when they superpose?

K) What is the lower of reflection? New power sketch a diagram of a light wave being reflected at an angle by a mirror. Label the incident and reflected waves, the normal, the angle of incidence and the angle of reflection.

L) A water wave travels through a gap about as wide as its wavelength. The gap is made slightly larger. How will the amount of diffraction change?

M) What happens when a light is shone at a slit about the same size as its wavelength?

N) a wave hits a boundary between two media head on. Describe what happens to the wave.

O) A wave hits a boundary between two medias and the angle. Describe what happens to the wave.

P) A wave hits the surface of the water in a pond at 23 degrees to the normal. The refractive index of the pond water is 1.3. What is the angle of refraction?

If you have any questions, email: Head of Subject - bunce.s@stowevalley.com