SECONDARY SCHOOL ANNUAL EXAMINATIONS 2009

Directorate for Quality and Standards in Education
Educational Assessment Unit

FORM 3 **PHYSICS** **TIME: 1h 30 min**

Name: _____ Class: _____

Answer all questions.
All working must be shown. The use of a calculator is allowed.
Where necessary take acceleration due to gravity g = 10m/s^2.

You may find some of these formulae useful.

Measurement & Density	$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$	$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$
Force	W = mg	Moment of a force = force x perpendicular distance
Energy & Work	Work done = F s	$\text{Power} = \frac{\text{Work done}}{\text{Time taken}}$
	PE = m g h	$\text{KE} = \frac{mv^2}{2}$
Pressure	$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$	Pressure = ρ h g
Waves	v = f λ	$\text{Frequency} = \frac{\text{number of waves}}{\text{time}}$
	$\text{Refractive Index of glass} = \frac{\text{speed of light in air}}{\text{speed of light in glass}}$	
	$\text{Magnification} = \frac{\text{height of image}}{\text{height of object}} = \frac{\text{image distance}}{\text{object distance}}$	

For office use only:

Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Max Mark	**8**	**8**	**8**	**8**	**8**	**15**	**15**	**15**	**85**
Actual Mark									

	Total Theory	**Total Practical**	**Final Mark**
Actual Mark			
Max Mark	85	15	100

SECTION A
Answer all questions in the space provided. This section carries 40 marks.

1.(a) In the below diagram, draw lines to join each physical quantity with a unit. An example has been done for you.

Force	s
Energy	Kg
Pressure	N
Frequency	J
Mass	Pa
Time	Hz

(5)

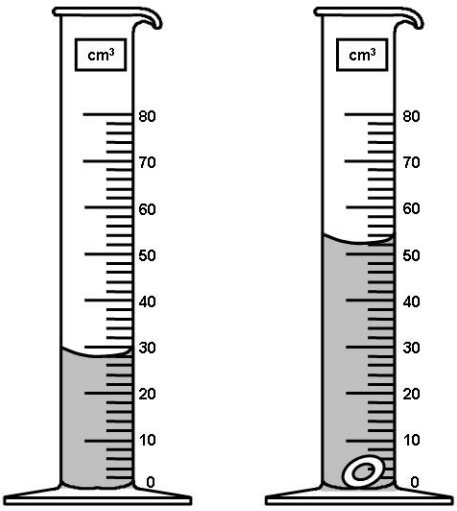
(b) Complete the following:

(i) A ruler is used to measure the _____ of an object.

(ii) _____ is used to measure the weight of an object.

(iii) 3.5kJ is equal to _____J. (3)

2. Claire has a metal ring. She uses a measuring cylinder to find the volume of the ring as shown.



(i) The initial volume of water is _____
(1)

(ii) The final volume of water is _____
(1)

(iii) The volume of the ring is _____
(1)

(iv) The mass of the metal ring is 214g. Calculate the density of the metal.

_____

_____
(2)

(v) The densities of three different metals are:

Metal	*Density (g/cm^3)*
Gold	19.3
Copper	8.9
Bronze	9.9

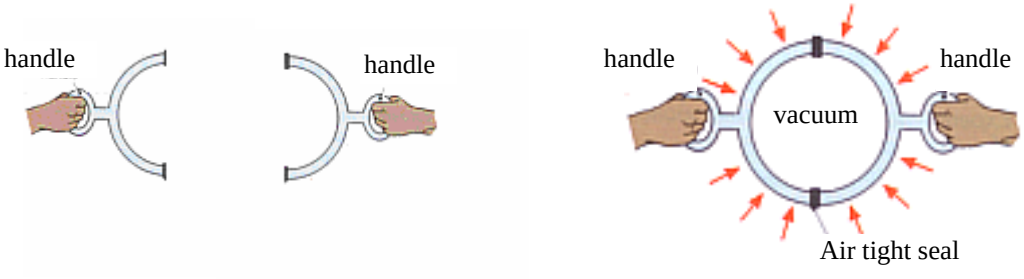
Which metal is the ring made of?

_____
(1)

(vi) Underline the correct answer: A bigger ring of the same metal will have *the same / more / less* density than the original ring.
Give **one** reason for your answer.

_____ (2)

3.(a) Otto von Guericke, (1602-1686), a German physicist, born in Magdeburg, performed a famous experiment: the 'Magdeburg Hemispheres'. He placed two halves of a large, hollow metal ball together and sucked out all the air from inside the ball. Two teams of eight horses could not pull the rings apart.



(i) Give **<u>one</u>** reason why air was sucked out from the inside of the ball.

_____

(1)

(ii) Explain why the two halves of the metal ball could not be pulled apart.

_____

(1)

(b) Jacob dives in a swimming pool.

(i) Using the formula $P = \rho hg$, calculate the pressure due to the water, when the Jacob is at a depth of 1.3m. (The density of water is $1000 kg/m^3$).

_____

_____

(2)

(ii) What is the pressure at the surface of the water called?

_____

(1)

(iii) If this pressure at the surface of the water is 101,000 N/m^2, calculate the **<u>total</u>** pressure on the diver.

_____

(1)

(iv) Complete the following sentence by choosing **<u>one</u>** word from the following:

increases, decreases, remains the same

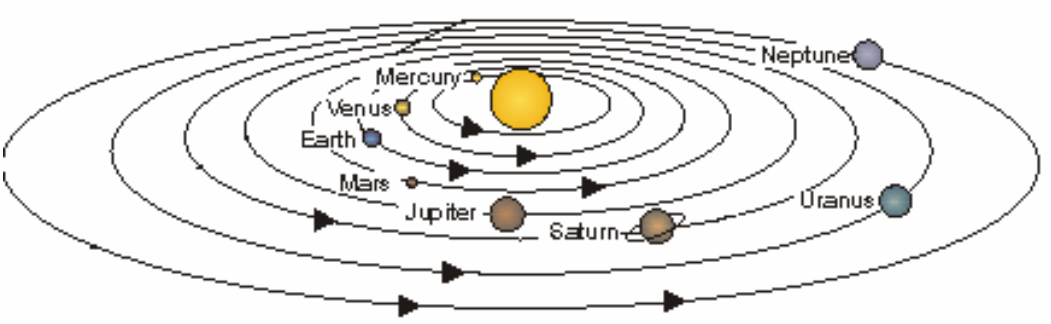
Pressure _____ as the diver goes deeper under the water.

Give **<u>one</u>** reason for your answer.

_____

(2)

4. The diagram represents our solar system.



(i) Rearrange the following in order of size, the **largest** first.

galaxy, universe, solar system

_____

(1)

(ii) How long does it take the earth to orbit the sun?

_____

(1)

(iii) Why would you expect Jupiter to take longer than Earth to orbit the sun?

_____

(1)

(iv) Give **one** reason why planets in our solar system orbit around the sun and not around Jupiter.

_____

(1)

(v) Name **one** natural satellite that orbits around Earth.

_____

(1)

(vi) Name **two** uses of artificial satellites.

_____

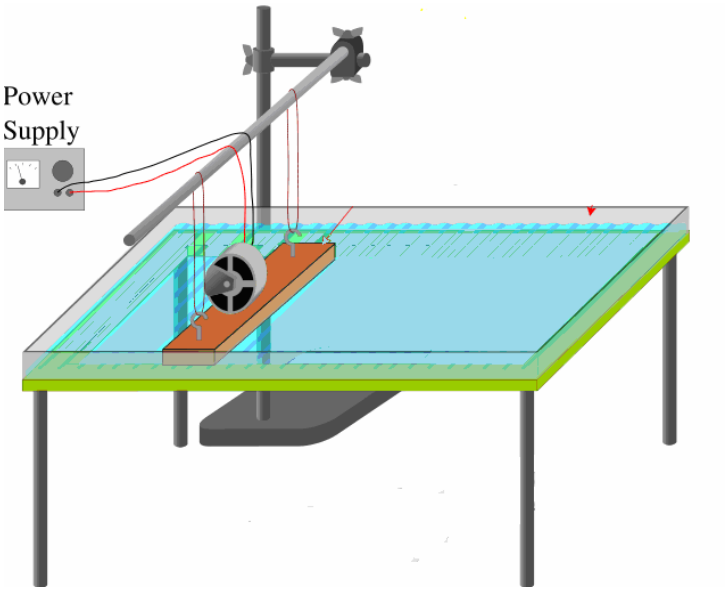
(2)

(vii) Name the force that keeps the satellites orbiting around the Earth.

_____

(1)

5. The following laboratory apparatus is used to demonstrate waves.



(a) Name the above laboratory apparatus. _____ (1)

(b) On the above diagram:

(i) draw the position of the lamp. (1)

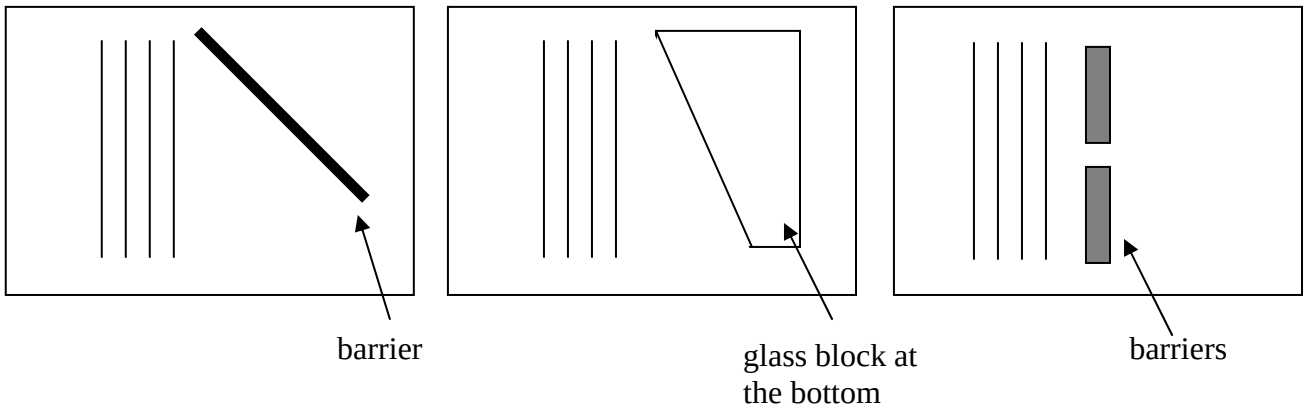
(ii) label the motor. (1)

(iii) mark with the symbol X, the position where the waves will be clearly visible. (1)

(c) How are the waves being produced?

_____ (1)

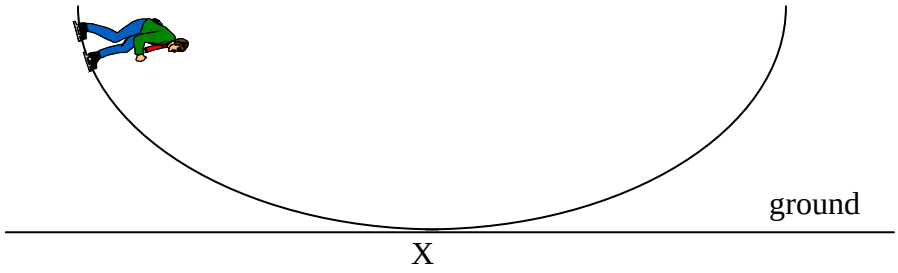
(d) Complete the wavefronts in **each** of the following diagrams.



(3)

SECTION B: Answer ALL questions. This section has a total of 45 marks.

6. A skater slides from one side to another of a skating track as shown.



(a) The Principal of Conservation of Energy states that, 'energy is neither _____ nor _____ but only changed from one form to another'.

(2)

(b) A table of the gravitational potential energy of the skater and the respective height above the ground is shown below.

Height (m)	0	1	2	3	4	5	6
Gravitational Potential Energy (J)	0	500	1000	1500	2000	2500	3000

(i) Draw a graph of gravitational potential energy (*y-axis*) against height (*x-axis*). (5)

(ii) From your graph,

- what is the gravitational potential energy when the height of the skater is 2.5m? _____ (1)
- what is the height of the skater when his gravitational potential energy is 1750J? _____ (1)

(c) The mass of the skater is 50kg.

(i) Using the formula P.E. = mgh, calculate the potential energy gained by the skater at a height of 3.2m above the ground.

_____

(1)

(ii) Assuming no loss in energy, give a value for the kinetic energy of the skater as the skater passes through point X as shown on the diagram.

_____

(1)

(iii) Using your answer to (ii) above, calculate the maximum velocity of the skater at point X.

_____

_____

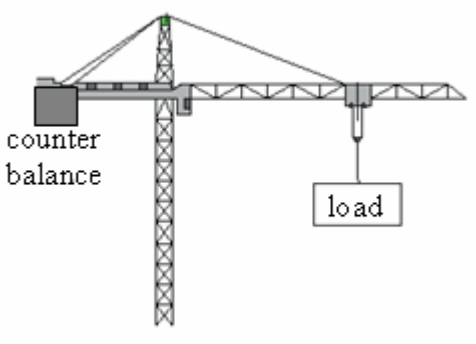
(2)

(iv) Explain why after some time the skater slows down and stops.

_____

(2)

7.(a) Simon and Claire observe a crane close to their school.



(i) **Draw** on the diagram the two forces acting on the load. (2)

(ii) **Name** these two forces.

_____

_____

(2)

(iii) The crane lifts a load of 30,000N through a vertical distance of 15m. Calculate the work done in lifting the load.

_____

_____

(2)

(iv) The load is lifted in 60 seconds. Calculate the power used in lifting the load.

_____

_____

(2)

(v) The crane has a counter balance on the opposite side of the load (see diagram). What is the purpose of the counter balance?

_____

(1)

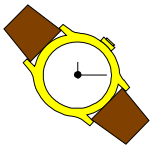
(b) Simon and Claire are curious to find the speed of sound in air. They use the crane outside their school to do an experiment. They observe that each time the load is moved the crane makes a loud noise.

They measure the time it takes between seeing the load move and hearing the sound.

(i) What type of wave is sound wave (transverse or longitudinal)?

_____

(1)



(ii) Draw a circle around the apparatus they should use to measure the time in this experiment. (1)

(iii) Name **one** precaution they need to take to measure the time accurately.

_____

(1)

(iv) They measure the distance from the crane to their school. Draw a circle around the apparatus they should use to measure the distance.

(1)

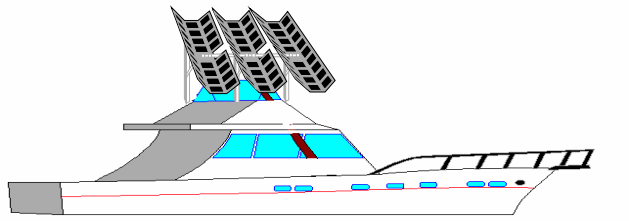
(v) The distance measured from the crane to the school is 200m and the time recorded is 0.6s. Use the formula speed = $\frac{\text{distance}}{\text{time}}$ to calculate the speed of sound in air.

_____

_____

(2)

8. (a) An engineer designed a boat that does not have sails or fuel tanks. It is powered only by batteries which are charged by solar energy. The boat has its roof top covered with solar panels as shown in diagram. The sun provides the energy to push the boat forward.



(i) Is solar energy renewable or non-renewable?

_____

(1)

(ii) Write a tick ✓ to show whether **each** of the following is TRUE or FALSE

	TRUE	FALSE
Solar energy is a clean source of energy		
The production of electricity from solar energy causes pollution		
The use of solar energy is highly recommended for the Mediterranean countries		
The use of solar energy means that less fossil fuels are burned at the power station		

(4)

(iii) How does the boat travel at night?

_____

(1)

(iv) Complete the following energy diagram for the movement of the boat.

Solar energy → _____ → _____

(2)

(b) Another engineer suggested that the electricity necessary for a whole village may be supplied by a number of wind turbines.

(i) Is wind energy renewable or non-renewable?

_____

(1)

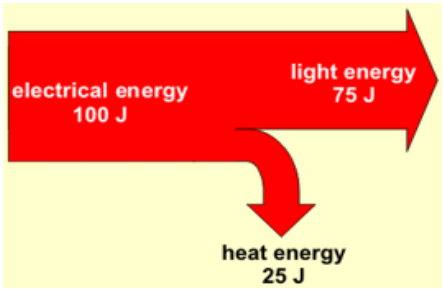
(ii) Name **one** major advantage and **one** major disadvantage of using wind energy instead of burning fossil fuels.

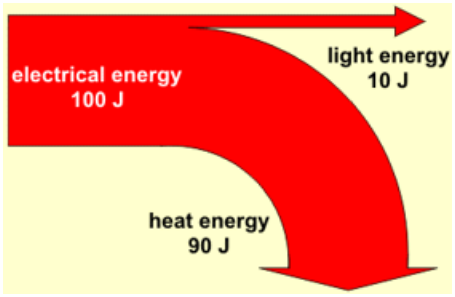
Advantage: _____

Disadvantage: _____

(2)

(c) (i) The energy diagram of two types of bulbs are shown below. Write beneath each diagram (i) filament bulb, or (ii) energy saving bulb.





_____ _____

(2)

(ii) Explain your answers.

_____

_____

(2)