THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

031/1 **PHYSICS 1**

(For Both School and Private Candidates)

Time: 3 Hours **Monday, October 10th, 2011 a.m.**

Instructions

1. This paper consists of sections A, B and C.

2. Answer **all** questions in sections A and B and **one (1)** question from section C.

3. Calculators and cellular phones are **not** allowed in the examination room.

4. Write your **Examination Number** on every page of your answer booklet(s).

5. Where necessary use the following constants:

   (i) Acceleration due to gravity, $g = 10\ m/s^2$
   (ii) Velocity of sound in air, $v = 333m/s$
   (iii) Pi, $\pi = 3.14$

SECTION A (20 marks)

Answer **all** questions in this section.

1. For each of the items (i) - (x) choose the correct answer among the given alternatives and write its letter beside the item number.

(i) The addition of impurities to element like silicon is aimed at
- A making p-n junction.
- B increasing the conductivity of the element.
- C stabilizing the temperature of the element
- D making the element heavier.
- E increasing the resistivity of the element.

(ii) According to the usual transformer notation, which of the following equations is correct?

A $I_S / I_P = N_S / N_P$ B $I_S / I_P = V_P / V_S$ C $I_S / I_P = V_S / V_P$

D $N_P / N_S = V_S / V_P$ E $V_S / I_P = N_S / N_P$

(iii) When a person perspires on a hot day
- A evaporation occurs and helps to cool the body.
- B heat is conducted away from the body.
- C latent heat keeps the body warm.
- D the body is insulated from the warm air.
- E convection cools the body.

(iv) Which of the following sources of energy are non-renewable?
- A Water, wind, wood and natural gas.
- B Fossils, sun, oil and nuclear.
- C Natural gas, water, nuclear and wood.
- D Wind, sun, fossils and oil.
- E Oil and all natural gas.

(v) Heat is supplied at equal rates to equal masses of water and aluminium. The temperature of aluminium rises more quickly than that of water because the aluminium has
- A a lower latent heat. B a higher heat capacity.
- C a higher specific heat capacity. D a higher latent heat.
- E a lower specific heat capacity.

(vi) Which of the following device works on d.c. only?
- A an electric bell.
- B a step-down transformer
- C a transistor
- D an induction coil
- E a step-up transformer

(vii) Which statement is correct regarding alpha particles?

A They carry a negative charge.
B They are hardly deflected by magnetic fields.
C They travel a long distance in air.
D They are very penetrating.
E They are identical with the nuclei of hydrogen atoms.

(viii) The cost of electricity for a 2000W electric fire used for 10.30 hours at the rate of shs 8.00 per KWh is

A shs 160 B shs 80 C shs 168
D shs 1600 E shs 3200

(ix) The following is an important sign that can be observed before an earthquake occurs:

A The average temperature keeps decreasing daily.
B Television signals and radio stations are received at a frequency that is below normal.
C The entire animal kingdom becomes highly disturbed and restless.
D The level of water in the ocean decreases by one third.
E Formation of backward rivers due to sudden shaking of the earth.

(x) Water spreads and wets a surface when spilled on it because the

A adhesive forces between water molecules and surface molecules are large.
B cohesive forces between water molecules and surface molecules are large.
C adhesive forces between water molecules are small.
D cohesive forces between water molecules and surface molecules are small.
E cohesive forces are greateer than adhesive forces.

2. Math the items in **List A** with responses in **List B** by writing the letter of the correct response beside the item number.

List A	List B
(i) Mirage	A The force of friction between molecules of the same substance which exist on the surface of water.
(ii) Refractive index	B Caused by total internal refraction of light.
(iii) Critical angle	C Liquids which are difficult to stir and do not flow easily.
(iv) Floating body	D Angle of reflection for which the angle of incidence is 90°.
(v) Brownian movement	E A very thin pipe which enables the hydrometer to float up right in liquid.
(vi) Viscosity	F The ratio of sine of angle of refraction to the sine of angle of incidence.
(vii) The siphon	G Attraction force which allows the moon to move around the earth.
(viii) A couple	H The property of water surface to support the needle.
(ix) Capillarity	I A glass tube used for releasing an accurate amount of liquid.
(x) Surface tension	J Angle of incidence for which the angle of refraction is 90°.
	K Consists of two equal and opposite parallel forces and has turning effect.
	L Force that causes elastic material to twist.
	M Apparent weight is zero.
	N Upthrust of a liquid is equal to the apparent weight of the floating body.
	O The pull that resist the flow of liquids.
	P The ratio of speed of light in air to that in media.
	Q Tendency of a liquid to be drawn into small openings.
	R Random motion of water molecules.
	S The chain and ball flushing tank.
	T Irregular motion of tiny particles suspended in fluid.
	U Bending of light which makes objects appear at incorrect position.

3. For each of the items (i)-(x) fill in the blank spaces by writing the correct answer on the answer booklet provided.

   (i) _____ is an instrument which can be used in submarines to view distant objects which are out of direct vision.

   (ii) _____ is a coil of low resistance used to control an alternating current.

   (iii) The property of a liquid to form a layer which support a pond skater to walk on it is called _____.

   (iv) According to Archimedes principle upthrust is equal to _____.

   (v) _____ is a refreezing process which demonstrate the effect of pressure on the melting point of ice.

   (vi) To convert a moving coil galvanometer into a voltmeter _____ is connected in series with the coil of the galvanometer.

   (vii) The instrument used to record ground movements caused by an earthquake is called _____.

   (viii) _____ is a large celestial body made up of hot gases known as plasma.

   (ix) The process in which the emission of radiation by the atmosphere warms the earth's surface is called _____.

   (x) _____ of water is the decrease in the density of water as it cooled from 4°C to 0°C.

SECTION B (60 marks)

Answer **all** questions in this section

4. (a) (i) Define moment of a couple
   (ii) Under what conditions will two forces form a couple?

   (b) (i) When is a body said to be in a stable equilibrium?
   (ii) The diameter of a uniform cylinder is 0.2m and its height is 0.4m. The cylinder is placed on an inclined plane. Calculate the maximum angle to the horizontal to which the plane can be inclined before the cylinder falls down.

   (c) (i) State the principle of moment.
   (ii) A heavy metal beam AB of mass 25kg is supported at its ends. The beam carries a mass of 150kg at a distance of 0.75m from end A. If the beam is 2m long, determine the thrust at supports A and B.
   (iii) What assumption will you make to support your calculations in part (c)(ii) above?

5. (a) Heat and temperature are closely related but they are different. State how they are related and how they differ.

   (b) (i) What are the fixed points of a thermometer?
   (ii) The temperature of the melting point of ice and that of steam above water boiling at 760mmHg pressure are marked as 20 and 80 respectively on a certain thermometer. Calculate the thermometer reading when the temperature is 60°C.

6. (a) (i) What is a sonometer?
   (ii) Briefly explain when resonance is said to occur?

   (b) Two boys at 200m apart stand on one side of a high vertical cliff at the same perpendicular distance from it. When one fires a gun, the other hears the sound 0.6 seconds after the flash and the second sound 0.25 seconds after the first sound. Calculate the perpendicular distance of the two boys from the cliff.

   (c) Figure 1 illustrates part of the displacement-time graph of a wave traveling across water at a particular place with a velocity of 2m/s. Calculate:
   (i) the amplitude.
   (ii) the frequency
   (iii) the wavelength

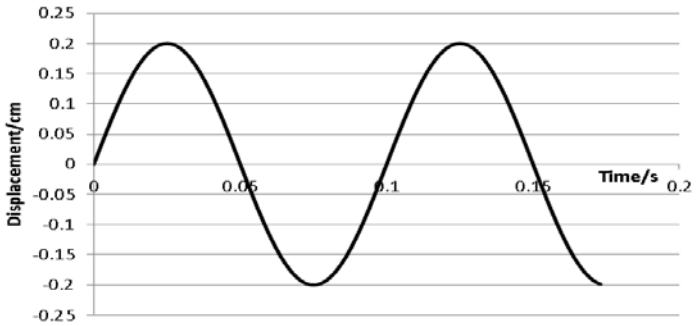

Figure 1

7. (a) (i) What are sustainable energy sources?
   (ii) State four applications of energy generated from water.

   (b) (i) Define geothermal energy.
   (ii) Briefly explain how geothermal energy can be harnessed.

   (c) (i) What is a windmill?
   (ii) Mention three disadvantages of energy caused by wind.
   (iii) Does wind itself posess energy? Explain.

8. (a) Explain what will happen when three 1.5V – cells are connected:
   (i) in series
   (ii) in parallel

(b) If the resistances of the ammeters in Figure 2 are ignored, explain each of the following observations:

(i) when switch S is closed, the current through A_1 is less than that through A_2.

(ii) when switch S is opened, the current through A_2 falls.

(iii) when switch S is opened, the current through each ammeter is the same.

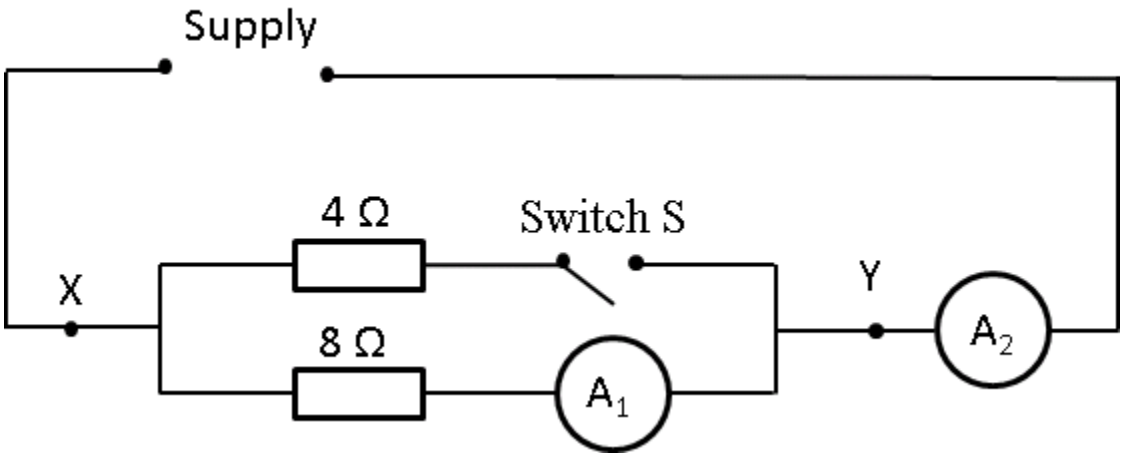

Figure 2

9. (a) Define the term earthquake.

(b) Briefly explain the meaning of the following terms as used on earthquake:

(i) Hypocentre

(ii) Epicentre

(c) (i) What is global warming?

(ii) Name four gases that contribute to global warming and give one source of each.

SECTION C (10 marks)

Answer **one (1)** question from this section.

10. (a) (i) State the Law of Floatation.
(ii) Mention two conditions that can make an object float.

(b) (i) Draw a well-labeled diagram of a hydrometer.
(ii) Briefly explain how hydrometer can be used to measure the relative density of a liquid.

(c) An iron cube of mass 480g and density $8g/cm^3$ is suspended by a string so that it is half immersed in an oil of density $0.9g/cm^3$. Find the tension in the string.

11. (a) (i) What is meant by a fuse?
(ii) Briefly explain why fuse are made of very thin wires but heaters are made of thick wires.

(b) (i) State how short circuit occurs in a house?
(ii) Mention two causes of electrical short-circuit.

(c) (i) Fuse wires are labeled 3A, 5A, 10A, 12A, 18A and 20A. Select the best fuse for a 240V; 2.856kW electric kettle.
(ii) Describe with the aid of circuit diagram, how would you determine the resistance of a conductor using the ammeter-voltmeter method.