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, 11th November 2013 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 the following constants may be used:

   (i) Acceleration due to gravity, g = 10 N/kg or 10 m/s^2
   (ii) Density of air = 1.2 kg/m^3
   (iii) Density of mercury = 13200 kg/m^3
   (iv) Density of water = 1000 kg/m^3
   (v) Linear expansivity of steel = 11 x 10^{-6} K^{-1}
   (vi) Pi, $\pi = 3.14$

SECTION A (30 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) Tow forces of 5 N and 8 N are acting at the same point and are inclined at an angle of 45° to each other. What will be their resultant force?
A 11.2 N
B 12 N
C 22.4
D 1.2 N
E 1.12 N

(ii) Which of the following are good examples of ferromagnetic materials?
A iron and ceramic
B zinc and iron
C copper and nickel
D nickel and cobalt
E cobalt and ceramic

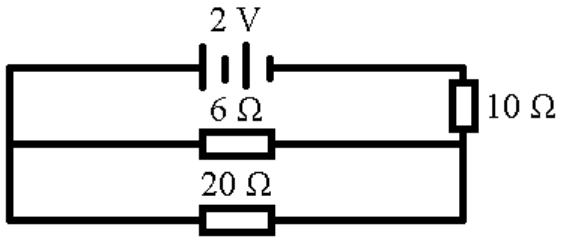
(iii) A white shawl wrapped around a baby keeps the baby warm because the shawl
A is a poor reflector
B is a poor radiator
C has pockets of air trapped in it
D conducts heat to the baby
E stops convection currents.

(iv) A body is said to be in equilibrium if
A it moves with uniform speed
B the net force acting on it is zero
C the upward and downward forces are equal
D its centre of gravity is low positioned
E its centre of gravity is high.

(v) The correct statements about sound waves is that they
A are transverse waves
B can travel in vacuum
C can be polarized
D cannot be polarized
E do not require medium.

(vi) In order to produce electrons in a discharge tube the
A anode should be at a higher potential than the cathode
B potential difference at the anode should be low
C cathode should be heated indirectly at low voltage supply
D electrodes should be at the same potential
E electrons must be accelerated at higher potential.

(vii) The battery in the circuit shown in the following diagram has an e.m.f. of 2 V and negligible internal resistance.



What will be the current flowing in the 6 Ω resistor?
A 0.15 A
B 0.64 A
C 1.42 A
D 0.10 A
E 0.33 A

(viii) The image formed by plane mirrors are always
A real, magnified and laterally inverted
B virtual, laterally inverted and same in size
C magnified, virtual and erect
D laterally inverted, same in size and real
E erect, real and magnified.

(ix) Which of the following particles is used to cause fission in an atomic reaction?
A proton
B deuteron
C neutron
D beta-particle
E alpha-particle

(x) The layer in the atmosphere where weather phenomena are formed is called
A stratosphere
B magnetosphere
C thermosphere
D troposphere
E exosphere.

2. Match 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)	The lowest energy level where electrons are normally present.	A	Light-emitting diode (LED)
(ii)	The amplitude levels which usually occurs in any digital signal.	B	Transducers
(iii)	The energy level where electrons may not occupy.	C	Rectification
(iv)	Increases the electrical conductivity of a semiconductor.	D	Bipolar transistor
(v)	Produces an abundance of mobile electrons in the material.	E	Semiconductors
(vi)	The region near the boundary which is fairly free of majority charge carriers.	F	Valence band
(vii)	Materials which have significant electrical conductance at room temperature.	G	Nodes
(viii)	Increases the region or width of the depletion layers and rise the potential barrier.	H	Fermi level
(ix)	Convert an input signal of one form into an output signal of another form.	I	Reverse bias
(x)	The relationship between input signal and output signal of an amplifier.	J	Transfer function
		K	n-type doping
		L	Dopants
		M	Forbidden
		N	Thermistors
		O	Depletion layer

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

(i) What is a term given to a glowing asteroid in space which can be seen with naked eyes? _____

(ii) The timbre of a sound is also referred to as _____.

(iii) The angle between the horizontal component of the Earth's magnetic field and true north is called _____.

(iv) The production of an e.m.f. in a conductor as a result of changing current in the same conductor is referred to as _____.

(v) The combination of multiple echoes in the listener's ear produce a louder and more sustained sound called _____.

(vi) When the temperature at the surface is below the freezing point, dew takes the form of ice called _____.

(vii) The movement of particles from a region of high concentration to one of low concentration is called _____.

(viii) Wheelbarrows and bottle openers are in the _____ class of levers.

(ix) The process of converting sinusoidal wave forms into unidirectional (non-zero) waveforms is known as _____.

(x) A resistor of low resistance used to convert a moving coil galvanometer into an ammeter is called _____.

SECTION B (60 Marks)

Answer **all** questions in this section.

4. (a) Mention three differences between boiling and evaporation.

(b) Briefly explain reasons for the following:
(i) When a cold bottle is brought into a warm room, it becomes misted over
(ii) Frost is more likely to occur on a clear night than on a cloudy night.

(c) (i) Define coefficient of linear expansion and give its SI unit.
(ii) A metal pipe which is 1 m long at 40°C increases in length by 0.3% when carrying a steam at 100°C. Find the coefficient of expansion of the metal.

5. (a) The half-life of a certain radioactive substance is 64 days. Explain the meaning of this statement.

(b) A certain radioactive material has a half-life of 2 minutes. If the initial count rate is 256 per minute;
(i) how long does it take to reach a count rate of 32 per minute?
(ii) what fraction of the original number of atoms is left undecayed?

(c) (i) What is meant by nuclear fission?
(ii) A uranium nucleus, U-238, with atomic number 92, emits two α-particles and two β-particles and finally forms a thorium (Th) nucleus. Write the nuclear equation for this process.

6. (a) Briefly explain why
   (i) Nylon clothes crackle when undressed?
   (ii) Petrol road tankers usually have a length of metal chain hanging and touching the ground?

   (b) What would happen when
   (i) an ebonite rod is rubbed with fur?
   (ii) a glass rod is rubbed with fur?

   (c) (i) Define electric current.
   (ii) Two cells each of e.m.f. 6 V and internal resistance of 5 Ω and 6 Ω respectively are connected in parallel to a resistor of 10 Ω. Find the current flowing in the 10 Ω resistor.

7. (a) What is an altimeter?

   (b) Briefly explain the reasons for the following:
   (i) A person at great height suffers from nose bleeding.
   (ii) It is painful to walk barefoot on a road that is covered by pebbles.

   (c) A cube of sides 2 cm is completely submerged in water so that the bottom of the cube is at a depth of 10 cm. Calculate:
   (i) the difference between the pressure on the bottom of the cube and the pressure on its top.
   (ii) the weight of water displaced by the cube.

8. (a) (i) What is meant by impulse of a force?
   (ii) Briefly explain why seat-belts are designed to stretch in a collision.

   (b) (i) Define momentum.
   (ii) The cork of a bottle of mass 4 g is ejected with a velocity of 10 m/s in 0.1 second. Find the force exerted on the bottle.

   (c) A car of mass 2000 kg is travelling along a straight road at a constant velocity of 10 m/s developing 3.0 kilowatts. If the engine of the car is switched off:
   (i) Calculate the energy lost by the car in coming to rest
   (ii) Briefly explain the energy changes in the process stated in (c) above.

9. (a) What is meant by the following terms as used in geophysics:
   (i) Tsunami.
   (ii) Magma.

(b) (i) List down the various layers of the atmosphere starting from the Earth's surface.

(ii) Which layer in part (b) (i) above is nearest to the Earth? Explain two importances of it.

(c) (i) What is a constellation?

(ii) Briefly explain the causes of ocean tides.

SECTION C (10 Marks)

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

10. (a) (i) State the laws of electromagnetic induction.

(ii) Mention two advantages of a.c. generators over d.c. generators.

(b) (i) Briefly explain why the core of a transformer is made of thin layers of metal insulated from one another.

(ii) Describe the structure of a step-up transformer and state how it works.

(c) A transformer with 4800 turns in the primary coil is designed to work form 240 V a.c. mains to give a supply of 8 V in order to ring a bell.

(i) What would happen if the transformer were connected to a 240 V d.c. mains?

(ii) Briefly explain why the primary current increases when a bell is being rung?

11. (a) Mention two practical examples in our daily life in which the principle of conservation of energy is applied.

(b) (i) What is a simple pendulum.

(ii) Describe the energy changes that take place when a simple pendulum swings from one side to another.

(c) Name a machine or an apparatus used to change the following forms of energy.

(i) Heat energy to mechanical energy.

(ii) Mechanical energy to electrical energy.

(iii) Electrical energy to sound energy.

(iv) Sound energy to electrical energy.

(v) Heat energy to electrical energy.