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, 15th October 2012 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, $g = 10\ m/s^2$ or 10 N/kg
   (ii) Atmospheric pressure = 0.76 mHg
   (iii) Density of water = $1\ g/cm^3$
   (iv) 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) One advantage of the lead-acid accumulator is that
- A Its internal resistance is high
- B Its p.d. is less than 2 V
- C It can be recharged
- D Its e.m.f. is more than 10 V
- E It supplies only a small current.

(ii) When an object moves around a horizontal circle of centre O with a constant speed its acceleration will be:
- A zero
- B towards the centre
- C away from the centre
- D along the tangent to the circle
- E along the direction of rotation

(iii) A total eclipse of the Sun is due to
- A the Moon coming between the Earth and the Sun
- B the Earth coming between the Moon and the Sun
- C the Moon reflecting light away from the Earth
- D the Sun coming between the Earth and the Moon
- E the Earth reflecting light away from the Moon.

(iv) Short-sightedness in a human eye is due to
- A eyeball being too short
- B eyeball being too large
- C eye lens being too weak
- D eye lens being smaller than retina
- E eyeball being larger than retina

(v) In Figure 1, a hydraulic press P is used to raise a load of 10000 N. A force F of 25 N is applied at the end of a lever pivoted at O to just raise the load.

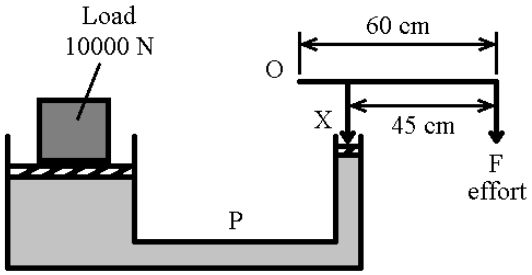


Figure 1

What will be the value of force X applied to the press?

A 1500 N
B 100 N
C 1125 N
D 33.33 N
E 13.33 N

(vi) The note from a plucked guitar will have a low pitch if the string is

A thick and long
B thick and slack
C thin and slack
D thin and short
E thick and short.

(vii) Lenz's law can be applied to predict the

A magnitude of back e.m.f. in a circuit
B magnitude of induced current in a circuit
C direction of applied e.m.f. across the circuit
D direction of induced e.m.f. in a circuit
E direction of the applied e.m.f. within a circuit.

(viii) The half-life of a certain radioactive element is 12 hours. What fraction of an element will have disintegrated in 72 hours?

A 1/64
B 1/16
C 1/32
D 1/8
E 1/72

(ix) The mass of an atom depends on the number of

A protons only
B neutrons, electrons and protons
C electrons and protons
D neutrons and protons
E electrons and neutrons

(x) The interior structure of the Earth is composed of three major zones which are:

A magma, mantle and the core
B lava, crust and magma
C hypocenter, crust and the mantle
D the core, lava and hypocenter
E crust, mantle and the core.

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 motion of a body through equal distances in equal times	A. Uniform deceleration
(ii) Displacement per unit time	B. Displacement
(iii) Area under velocity-time graph	C. Resultant velocity
(iv) The rate at which an object travels	D. Uniform speed
(v) Constant displacement along the road in equal times	E. Average velocity
(vi) The gradient of displacement-time graph	F. Straight line graph
(vii) Uniform accelerated motion of a body	G. Speed
(viii) The rate of decrease of constant velocity	H. Average acceleration
(ix) A measure of how far a body is from a starting point	I. Uniform velocity
(x) The gradient of velocity-time graph	J. Distance
	K. Retardation
	L. Non-uniform velocity
	M. Velocity
	N. Instantaneous velocity
	O. Constant velocity

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

(i) Refractive index is a constant involved in _____.

(ii) The parallel forces which are equal in magnitude but acting in opposite direction to each other are known as _____.

(iii) Latent heat of vaporization is responsible for changing the state of a substance from liquid to vapour without changing of _____.

(iv) The multiple reflection of sound waves when they are placed in an enclosed room or cavity is called _____.

(v) A radioactive nucleus $^{123}_{60}X$ decays to $^{119}_{58}Y$ by emitting _____.

(vi) Radiant energy can be detected by means of _____.

(vii) In order to measure the current passing through an electric component, ammeter is always connected in _____.

(viii) Geocentric theory under astronomy study was based on _____.

(ix) X-rays are electromagnetic waves of very short _____.

(x) A point within the Earth where an earthquake begins is called _____ _____.

SECTION B (60 MARKS)

Answer **all** questions in this section.

4. (a) Why does a solid body weigh more in air than when immersed in a liquid?

(b) An ordinary hydrometer of mass 27 g floats with 4 cm of its stem out of water. If the cross sectional area of the stem is 0.75 cm^2 calculate:
(i) the total volume of the stem just under the surface of the liquid.
(ii) the relative density of the liquid.

(c) (i) What do you understand by resolution of a force?
(ii) A metre rule is pivoted at its mid-point. If two objects of weights 1.0 N and 2.0 N are suspended at 30 cm and 90 cm respectively from one end, calculate the position where an upward force of 3.0 N must be applied in order for the metre rule to balance horizontally.

5. (a) Define the following terms:
(i) Newton.
(ii) Inertia.
(iii) Linear momentum.

(b) Two stones are thrown vertically upwards from the same point with the same velocity of 20 m/s but at an interval of 2 seconds. When they meet, the second stone is rising at 10 m/s. Calculate:
(i) the time taken by the second stone in air before they meet
(ii) the velocity of the second stone when they meet.

(c) A stationary bomb of mass 5 kg explodes into one part A of mass 2 kg flying off with a velocity of 60 m/s and another part B of mass 3 kg flying off with a certain velocity in the opposite direction. Calculate the
(i) velocity of part B
(ii) total kinetic energy produced by the explosion.

6. (a) (i) Explain how a gas exerts pressure on the walls of its container.
(ii) Give reason why it is not sensible to rub the canvas of a tent in wet weather.

(b) Explain two situations in which the phenomenon of surface tension is exhibited.

(c) An oil drop of volume 10^{-9} m^3 spreads out on water to form a film of area 0.2 m^2.
(i) estimate the length of an oil drop.
(ii) what assumption have you made in calculating part (c) (i) above.

7. (a) (i) Differentiate between resistance and resistivity of a given conductor.
(ii) Is it possible for two cells in parallel arrangement to drive more current through a resistor than one cell? Give reason.

(b) (i) What is '1 KILOWATT-HOUR' as applied to current electricity?
(ii) If you find a domestic electric bulb rated 60 W, 240 V what does this mean?

(c) Find the cost of running five 60 W lamps and for 100 W lamps for 8 hours if electric energy costs Tshs. 27/= per unit.

8. (a) What is meant by the following terms:
(i) global warming.
(ii) greenhouse effect.
(iii) earthquake.

(b) Mention three effects of global warming.

(c) (i) What is the major cause of global warming?
(ii) Briefly explain three measures that can be taken to control global warming.

9. (a) Define the following terms:
(i) binding energy.
(ii) thermonuclear fusion.

(b) (i) What is meant by background count? Give two sources of radiations always present in a neighbourhood of a detector.
(ii) How does the rate of escape of electrons from a metal relate to its temperature?
(iii) A sample containing 400 g of iodine-131 has a half-life of 8 days. How much of the sample will remain undecayed after 40 days?

(c) A radioactive material is denoted by the symbol $^{226}_{88}X$. Write down the composition of the nucleus during the end of the following stages of disintegration.

(i) the emission of an alpha-particle.
(ii) the further emission of a beta-particle.
(iii) the further emission of a gamma radiation.

SECTION C (10 Marks)

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

10. (a) (i) What is a transistor?
(ii) Mention two applications of transistors.

(b) (i) List down two types of diodes.
(ii) Briefly explain the mode of action of a forward bias in a p-n junction.

(c) Figure 2 shows a common-emitter amplifier circuit.

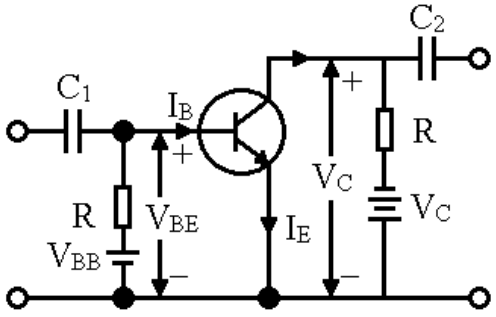


Figure 2

(i) Why is the circuit named so?
(ii) Explain the function of capacitors C_1 and C_2.

11. (a) State the application of each of the following apparatus:
(i) Manometer
(ii) Hygrometer
(iii) Barometer.

(b) (i) What is a siphon?
(ii) With the help of a labeled diagram explain the principle on which the siphon operates.

(c) (i) Briefly explain why a bubble of air increases in volume as it rises from the bottom of a pond to the surface.
(ii) A uniform tube 1.0 m long and closed at its upper end is pushed vertically downward into mercury until the liquid rises 0.2 m inside the tube. Calculate the depth of the open end below the mercury surface.