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 ***Friday November 07, 2003 a.m.***

Instructions

1. This paper consists of sections A, B and C.
2. Answer **ALL** questions in section A and B, and **TWO (2)** questions from section C.
3. Marks for each question or part thereof are indicated beside the question.
4. Cellular phones are **not** allowed in the examination room.
5. Write your answers neatly and systematically in the answer booklet(s) provided.
6. Write your Examination Number on every page of your answer booklet(s).
6. Wherever necessary use the following constants:

Acceleration due to gravity	g	=	1000 m/s^2
Pi	π	=	$\frac{22}{7}$.

SECTION A (20 Marks)

Answer **ALL** questions in this section.

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

   (i) A bus carrying a very big load on its top carrier can easily overturn because

   A it cannot run fast
   B its equilibrium is stable
   C its centre of gravity is low
   D it is more stable and can run fast
   E its centre of gravity is high.

   (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 bar of copper is heated from 293 K to 333 K. Identify a false statement among the following:

   A Its density will increase slightly
   B Its length will increase slightly
   C Its electrical conduction will decrease slightly
   D Its mass will not change
   E Its weight will remain unchanged.

   (iv) The direction of heat flow between two bodies is determined by

   A the direction of the wind
   B the mass of each body
   C the temperature difference of the two bodies
   D the coefficient of cubical expansion of the bodies
   E the coefficient of linear expansion of the bodies.

   (v) Refractive index of a glass block cannot be evaluated from one of the following ratios:

   A sin i to sin r
   B Velocity of light in air to velocity of light in glass
   C Frequency of light in air to frequency of light in glass
   D Wavelength of light in air to wavelength of light in glass
   E Real depth to apparent depth.

(vi) Which among the following is not a property of magnetic lines of force due to a bar magnet?

A They have a direction from North Pole to South pole outside the magnet
B They do not exist inside the magnet
C They have a direction from South pole to North pole inside the magnet
D They tend to be close inside the magnet but are wider apart outside the magnet
E They form complete loops.

(vii) When charging a body by friction, the particles which are transferred are

A protons B nuclei and protons C nuclei
D electrons E protons and electrons.

(viii) Which of the following statements is correct?

A Electrons but not X-rays are deflected by magnetic field
B Electrons and X-rays are both particles
C Electrons are deflected by magnetic field but not by electric field
D Electrons are heavy particles
E Electrons and X-rays are both deflected by magnetic field.

(ix) Cathode rays are

A a stream of energy
B used to examine a complete machine without dismantling it
C a stream of molecules
D a stream of electrons
E used to detect flaws and cracks in metal casings and welded joints.

(x) A transistor is a device which

A amplifies alternating current or voltage
B amplifies direct current or voltage
C rectifies direct current or voltage
D amplifies and rectifies alternating current or voltage
E rectifies alternating current.

2. Match the items in list A with the responses in list B by writing the letter of the correct response beside the item number. Each item carries 1 mark.

List A	**List B**
(i) Newton metre (Nm)	A Planet Jupiter
(ii) Reverberation	B Has donor impurity
(iii) Longitudinal wave	C Angle of variation
(iv) No evidence of having an atmosphere	D A tone heard when a tuning fork is sounded
(v) Neutral point	E Gamma rays
(vi) Motor	F Work done
(vii) β - radiation	G Application of momentum change
(viii) Angle between magnetic north and geographical north direction at the place concerned	H Basic physical quantities
(ix) Originate from the nuclei of an atom	I A point in magnetic field where resultant field is zero
(x) n-type semiconductor	J Planet Mercury
	K Controls temperature change
	L Sound waves
	M Prevents weakening of bar magnets
	N Converts electrical energy into mechanical energy
	O The multiple reflection of sound waves when they are placed in an enclosed room or cavity
	P Deflected by magnetic and electric field
	Q Paper thickness control
	R Has acceptor impurity
	S Rise and fall of sound of two vibrating objects
	T Angle of variation

SECTION B (60 Marks)

Answer **ALL** questions in this section.

3. (a) Define the following terms

(i) Acceleration (01 mark)

(ii) Power (01 mark)

(iii) Newton (01 mark)

(b) State Newton's second and third laws of motion. (02 marks)

(c) A 50 g mass is placed on a straight track sloping at an angle of 45° to the horizontal as shown in figure 1 below. Calculate

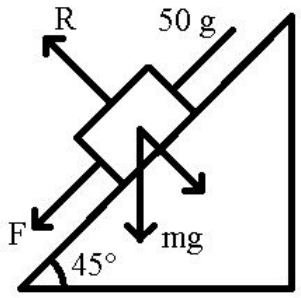


Fig. 1

(i) the acceleration of the load as it slides down the slope (02 marks)

(ii) the distance moved from rest in 0.20 seconds. (03 marks)

4. (a) A thermometer is directly dipped into the beaker containing boiling water.

(i) What does the thermometer measure? (01 mark)

(ii) What is the liquid in the thermometer? (01 mark)

(iii) What liquid would be used to measure a temperature of about -80°C? (01 mark)

(b) State what changes, if any, take place in the following:

(i) Melting point of ice when salt is added to the ice (01 mark)

(ii) The volume of water if it changes into ice (01 mark)

(iii) The boiling point of a liquid when the pressure on the liquid is reduced. (01 mark)

(c) A 50 watt heater is inserted in a 2 kg block of aluminium which also holds a thermometer. The temperature of the block rises by 8 K in 5 minutes. Neglecting heat losses, calculate the specific heat capacity of aluminium. (04 marks)

5. (a) Explain, with ray diagrams, the use of a lens

(i) as a magnifying glass (02 marks)

(ii) in a camera (02 marks)

(b) State the characteristics of the image formed in 5 (a) above (02 marks)

(c) The distance between the film and the lens in a camera is 6.25 cm when it is focused on an object 1.5 m from the lens. How far must the lens be moved, and in what direction, in order to focus the camera on the distant object? (04 marks)

6. (a) State the defects of a simple cell and explain how these defects may be minimized. (04 marks)

(b) Explain briefly what a fuse is. (01 mark)

(c) Select the best fuse for the following:

(i) A refrigerator rated 250 V, 400 W (01 mark)

(ii) The electric cooker rated 240 V, 7.2 kW (02 marks)

(iii) The electric iron rated 240 V, 2 kW. (02 marks)

7. (a) Why is high voltage used for commercial transmission of electrical energy? (02 marks)

(b) What is electromagnetic induction? (01 mark)

(c) Fig 2 below shows two coils X and Y. X is connected to a battery and Y is connected to a centre galvanometer G.

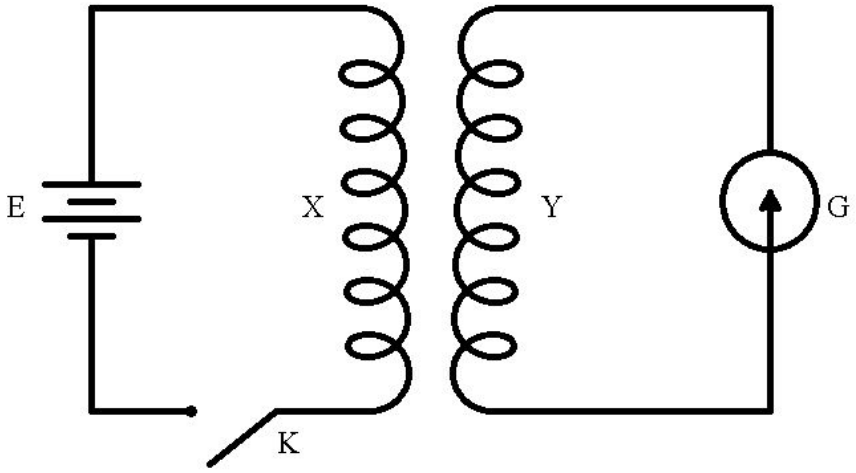


Fig 2

(i) State and explain the deflection of the galvanometer needle when the switch K is closed for a few seconds and then opened. (03 marks)

(ii) Why must the galvanometer be a centre zero type? (02 marks)

(iii) What would be done in X to increase the current induced in circuit Y? (02 marks)

8. (a) Write two properties of

(i) X-rays (01 mark)

(ii) cathode rays. (02 marks)

(b) (i) Give any four uses of cathode ray oscilloscope (CRO). (02 marks)

(ii) State two ways in which X-rays differ from gamma rays. (02 marks)

(c) A particular radioactive source has a half-life of 2.0 hours. A sample gives a count of 2400 per second at 11:00 a.m. When will the count have dropped to approximately 300 per second in the same counting system? (04 mark)

SECTION C (20 marks)

Answer **TWO (2)** questions from this section.

9. (a) Define impulse and state its SI unit. (02 marks)

(b) A volleyball A of mass 0.3 kg is moving on the ground at a speed of 4 ms^{-1} towards a football B which is at rest on the ground and has a mass 0.8 kg. When A collides with B, the balls remain in contact for 0.2 sec. After the collision, B moves forward with a velocity of 1.8 ms^{-1}. Find

(i) the velocity of A after the collision (02 marks)

(ii) the average force of A and B during the collision. (03 marks)

(c) Explain about the total kinetic energy of the systems before and after the collision. (03 mark)

10. (a) Distinguish between

(i) Comet and Asteroid (01 mark)

(ii) Star and Planet (01 mark)

(iii) Meteoroid and Meteor. (01 mark)

(b) State what is meant by

(i) Heliocentric theory (01 mark)

(ii) Geocentric theory. (01 mark)

(c) Mercury planet is 58 x 10^6 km from the sun and it takes 88 days to complete one orbit around the sun. Calculate the speed of the planet in km/hr to 3 significant figures. (05 marks)

11. (a) Define the following terms:

(i) Transistor (01 mark)

(ii) Doping (01 mark)

(iii) Rectification (01 mark)

(b) What are the differences between a conductor, a semiconductor and an insulator in terms of their energy band. (03 marks)

(c) Draw the circuit diagram of the full wave rectifier using only two diodes. (04 marks)