GREENWOOD HIGH
PRELIMINARY EXAMINATION 1 – DECEMBER 2019
SUBJECT – PHYSICS

Grade: 10
Date: 02/12/2019

Time: 2 hours
Max. Mark: 80

Answers to this paper must be written on the paper provided separately.
*You will **not** be allowed to write during the first 15 minutes.*
This time is to be spent in reading the question paper.
The time given at the head of this paper is the time allowed for writing the answers.

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*Attempt **all** questions from **Section I** and any **four questions** from **Section II***
The intended marks for questions are given in brackets [ ]

Section I (40 marks)

Answer **all** *questions*

Question 1

a) (i) State and define the S.I unit of power. [2]
(ii) How is the unit horse power related to the S.I unit of power?

b) Two bodies A and B have masses in the ratio 5:1 and their kinetic energies are in the ratio 125:9. Find the ratio of their velocities. [2]

c) (i) Define couple. [2]
(ii) Can the moment of force be zero even if the force is not zero? If so, when?

d) To which class of lever do the following belong? [2]
(i) a fishing rod
(ii) spade turning soil

e) Name the type of single pulley that can act as a force multiplier. Draw a labelled diagram of the above named pulley. [2]

Question 2

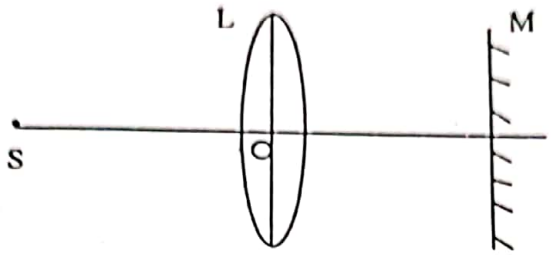
a) The power of a lens is -5D. [2]
(i) Find its focal length.
(ii) Name the type of lens.

b) (i) Which coloured light passing from glass to air, has the maximum critical angle? [2]
(ii) Why is white light considered to be polychromatic in nature?

c) A ray of light incident at an angle 48° on a prism of refracting angle 60° suffers minimum deviation. Calculate the angle of minimum deviation. [2]

d) An electromagnetic radiation is used for photography in fog. [2]
(i) Identify the radiation.
(ii) Why is this radiation mentioned by you, ideal for this purpose?

e) The diagram shows a point source of light S, a convex lens L, and a plane mirror M. [2]
These are placed such that rays of light, from S return to it after reflection from M.



(i) What is the distance OS called?
(ii) To which point (left of S, on S or right of S) will the rays return, if M is moved to the left and brought in contact with L.

Question 3

a) Two waves of the same pitch have amplitudes in the ratio 1:3. What will be the ratio of their: [2]
(i) Intensities and
(ii) Frequencies?

b) State two ways by which the frequency of transverse vibrations of a stretched string can be decreased. [2]

c) An electric bulb of resistance 500Ω, draws a current of 0.4 A. Calculate the power of the bulb and the potential difference at its ends. [2]

d) Identify the following wires used in a household circuit: [2]
(i) The wire is also called as the phase wire.
(ii) The wire is connected to the top terminal of a three pin socket.

e) (i) What happens to the resistivity of semiconductors with the increase in temperature? [2]
(ii) For a fuse, higher the current rating, ----------is the fuse wire.

Question 4

a) Draw a circuit diagram using the dual control switches to light a staircase electric light. [2

b) (i) State two factors on which the magnitude of induced emf depends. [2
(ii) State the function of a split ring (or commutator) in a D.C. motor.

c) (i) State whether the specific heat capacity of a substance remains the same when its state changes from solid to liquid. [2]
(ii) Give one example to support your answer.

d) A bucket contains 8 kg of water at 25 °C. 2 kg of water at 80 °C is poured into it. Neglecting the heat absorbed by the bucket, calculate the final temperature of water. [2]

e) A radioactive element ${}^{A}_{Z}X$ first emits a 'β' particle and then an alpha particle and the resulting nucleus can be represented ${}^{P}_{Q}Y$. What are the values of P and Q in terms of A and Z? [2]

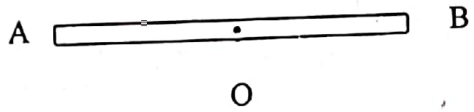
Section II (40 marks)

Answer any four questions

Question 5

a) A body of mass 10 kg is kept at a height of 5 m. It is allowed to fall and reach the ground. [3]
(i) What is the total mechanical energy possessed by the body at the height of 2 m assuming it is a frictionless medium?
(ii) What is the kinetic energy possessed by the body just before hitting the ground? Take g=10 m/s^2.
(iii) What kind of energy is possessed by a stretched rubber membrane?

b) (i) AB is a bar which is pivoted at the point O. [3]



Copy the diagram and mark the direction of two forces acting on the bar to produce rotation in it.

(ii) State the principle of moments.

(iii) Give one example in our daily life which works on the above principle.

c) Draw a diagram of combination of three movable pulleys and one fixed pulley to lift up a load. In the diagram, show the directions of load, effort and tension in each strand. Find: [4]
(i) the velocity ratio and
(ii) the efficiency of the combination, in the ideal situation.

Question 6

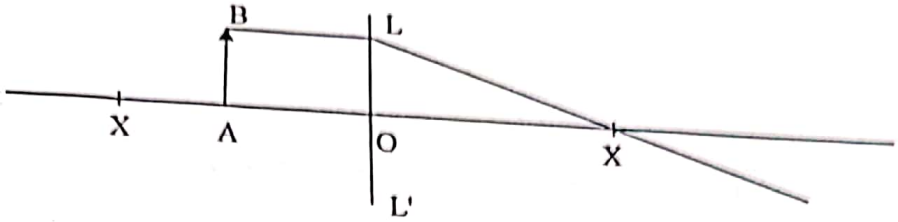
a) An object is placed at a distance of 24 cm from a convex lens of focal length 8 cm. [3]
(i) What is the nature of the image so formed?
(ii) Calculate the distance of the image from the lens.
(iii) Calculate the magnification of the image.

b) (i) Absolute refractive indices of glass and water are 3/2 and 4/3 respectively. What will be the refractive index of glass with respect to water? [3]

(ii) Mention one point of difference between reflection of light from a plane mirror and total internal reflection of light from a prism.

(iii) State the relation between the critical angle and the absolute refractive index of a medium.

c) [4]



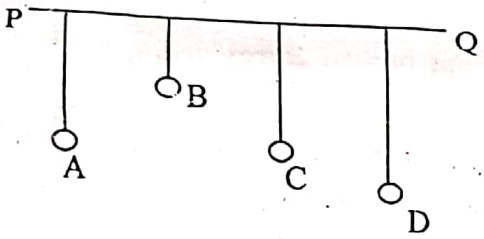
i) Copy and complete the ray diagram to show the formation of the image of the object AB.

ii) Name the lens LL'.

iii) Name a device in which this principle is used.

Question 7

a) In the diagram below, A, B, C and D are four pendulums suspended from the same elastic string PQ. The length of A and C are equal to each other while the length of pendulum B is smaller than that of D. Pendulum A is set into a mode of vibrations. [3]



i) Name the type of vibrations taking place in pendulums B and D.

ii) What is the state of pendulum C?

iii) State the reason for the type of vibrations in pendulum C.

b) (i) Draw a graph between the displacement and the time for a body executing free vibrations. [3]

(ii) Which characteristic of sound, makes it possible to recognize a person by his voice without seeing him?

c) (i) A wire of length 80 cm has a frequency of 256 Hz. Calculate the length of a similar wire under similar tension which will have frequency 1024 Hz. [4]

(ii) A certain sound has a frequency of 256 Hz and a wavelength of 1.3 m.

(1) Calculate the speed with which this sound travels.

(2) What difference would be felt by a listener between the above sound and another sound travelling at the same speed, but of wavelength 2.6 m?

Question 8

a) (i) What is conductance? State its S.I unit. [3]

(ii) A wire of resistance 6 Ω is stretched so that its length is increased to twice its original length. Calculate its new resistance.

(iii) A substance has nearly zero resistance at a temperature of 4 K. What is such a substance called?

b) (i) Draw a labelled diagram of a device you would use to transform 200V a.c to 15V a.c. [3]

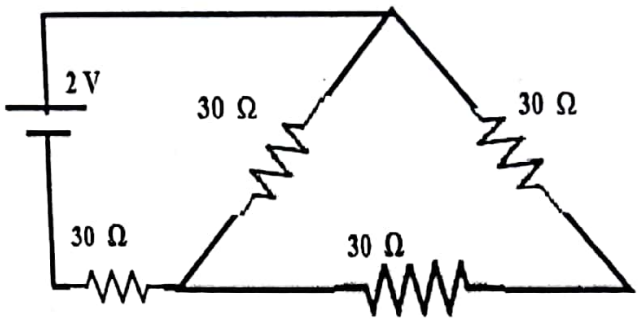
(ii) Why is the armature of an electric bell made of soft iron?

c) (i) The music system draws current of 400 m A when connected to a 12 V battery. [4]

(1) What is the resistance of the music system?

(2) The music system is left playing for several hours and finally the battery voltage drops and the music system stops playing when the current drops to 320 m A. At what battery voltage does the music system stop playing?

(ii) Calculate the current in the circuit shown below.



Question 9

a) Draw a labelled diagram of an a.c generator. [3]

b) (i) When 1 g of ice at 0℃ melts to form 1 g of water at 0℃, is the latent heat absorbed by the ice or given out by it? [3]

(ii) A certain amount of heat Q will warm 1 g of material X by 3℃ and 1 g of material Y by 4℃. Which material has a higher specific heat capacity?

(iii) Name the law on which the principle of mixtures is based?

c) A refrigerator converts 100 g of water at 20 ^{0}C to ice at -10 ^{0}C in 72 minutes. [4]
Calculate the average rate of heat extraction from water in watt.

Specific heat capacity of ice = 2100 J kg^{-1} K^{-1}

Specific heat capacity of water = 4200 J kg^{-1} K^{-1}

Specific latent heat of fusion of ice = 336000 J kg^{-1}

Question 10

a) (i) What is nuclear fusion? Give one example and write its nuclear reaction. [3]
(ii) Why is fusion reaction also called thermo-nuclear reaction?

b) (i) How are β-rays emitted from a nucleus while it does not contain electrons? [3]
(ii) Name the radiation which has the highest ionizing power.
(iii) Give any two important sources of background radiation.

c) i) Mention two important precautions that should be taken while handling radioactive materials. [4]
(ii) Can we use α-particle in radio-therapy? Why?
(iii) Uranium emits a γ ray. What is the resulting nucleus?
(iv) Give one use of radio- isotopes.