GREENWOOD HIGH
PRELIMINARY EXAMINATION 2 - JANUARY 2020
SUBJECT – PHYSICS

Grade 10
Date: 03.01.2020

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.*

*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)

Attempt *all* questions from this section.

**Question 1**

**a)** Name the force required to keep a body moving in uniform circular motion. State its direction. [2]

**b)** A stone of mass 100 g is thrown vertically upwards with a velocity of 20 $ms^{-1}$. What is the potential energy of the stone at the highest point? [2]

**c)** Give one example for each of the following.
(i) Heat energy changes into mechanical energy
(ii) Mechanical energy changes into electrical energy [2]

**d)** State the class of levers and the relative positions of load (L), effort (E) and fulcrum (F) in
(i) bottle opener (ii) sugar tongs [2]

**e)** What is the relationship between MA and VR for:
(i) an ideal machine (ii) a practical machine [2]

**Question 2**

**a)** Draw a labelled diagram to show the path of a monochromatic ray of light in a prism kept at its angle of minimum deviation. [2]

**b)** An object placed at the bottom of a tank appears to be raised by 2 m. If the refractive index of water is $^4/_3$, what is the actual depth of water tank? [2]

**c)** (i) Define critical angle.
(ii) Does it depend on the wavelength of incident light? If yes, how? [2]

**d)** Copy and complete the following table. [2]

| Type of lens | Position of object | Nature of image | Size of image |
|---|---|---|---|
| Convex | Between $F_1$ and $2F_1$ | | |
| Concave | At infinity | | |

**e)** Why does sky appear blue? [2]

**Question 3**

a) What characteristic of sound would change if there is a change in its
(i) waveform?
(ii) frequency? [2]

b) (i) State one factor which affects the frequency of sound produced due to vibrations in an air column. [2]
(ii) Name the unit used for expressing the sound level. [2]

c) What is noise pollution? Mention one source of noise pollution.

d) An electrical heater is rated 4 kW, 220 V. Find the cost of using this heater for 12 hours if one kWh of electrical energy costs Rs. 3.50. [2]

e) How is the magnetic field due to a solenoid carrying current affected if
(i) A soft iron is placed inside the solenoid?
(ii) Strength of current is decreased? [2]

**Question 4**

a) The heat capacity of a vessel is 150 $JK^{-1}$. Calculate the heat energy required to raise its temperature from 293 K to 373 K. [2]

b) State the meanings of following statements.
(i) The specific heat capacity of copper is 400 $Jkg^{-1}K^{-1}$.
(ii) The specific latent heat of fusion of ice is 336 $Jg^{-1}$. [2]

c) State any two properties of α radiation. [2]

d) Give any two differences between nuclear fission and nuclear fusion. [2]

e) An element ${}^{A}_{Z}X$ emits two β particles followed by emission of γ radiation to form Y. Write the nuclear reaction for the above nuclear change. [2]

**Section II – (40 Marks)**

Attempt any *four* questions from this section.

**Question 5**

a) A uniform metre rod is balanced at the 70 cm mark by suspending a weight of 50 gf at the 40 cm mark and 200 gf at the 95 cm mark. Draw a diagram of the arrangement and calculate the weight of the metre rod. [3]

b) An object is placed at a distance of 15 cm from a convex lens of focal length 10 cm. Calculate the image distance and state its characteristics. [3]

c) Show that the mechanical energy of a freely falling body remains conserved. [4]

**Question 6**

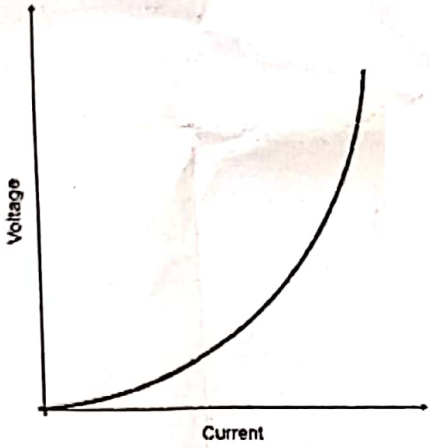
a) (i) Express the refractive index μ of a medium:
(1) In terms of velocity of light
(2) In terms of the angle of incidence 'i' in air and the angle of refraction 'r' in denser medium.
(ii) If a ray of light passes from medium 1 to medium 2 without any change of direction, what can be said about the refractive indices of these media?
(angle i is not $0^0$) [3]

b) (i) What is an echo?
(ii) State two conditions for an echo to take place. [3]

c) (i) Where should an object be placed so that a real and inverted image of the same size as the object is obtained using a convex lens?
(ii) Draw a ray diagram to show the formation of the image as specified in part c (i). [4]

**Question 7**

a) (i) Figure below shows the V-I graph for a material. What is the material called?




(ii) Two copper wires are of same length, but one is thinner than the other.
(1) Which wire will have more resistance?
(2) Which wire will have more specific resistance? [3]

b) (i) A fuse wire rated 10 A is not suitable to be used with an electrical appliance rated 5 kW, 200 V. Justify the statement.
(ii) Name two safety devices which are connected to the live wire of a household electric circuit. [3]

c) A man standing in front of a wall produces sound and hears an echo after 3 s. He walks 'x' m away from the wall and produces the same sound. Now he hears an echo after 5 s. Calculate the distance he walked away from the wall. (Speed of sound in air is 340 $ms^{-1}$) [4]

**Question 8**

a) When 40 g of water is heated, its temperature rises by 20 K. When the same amount of heat energy is given to 120 g of a liquid its temperature rises by 25 K. Calculate the specific heat capacity of the liquid.
(Specific heat capacity of water is 4200 $Jkg^{-1}K^{-1)}$ [3]

b) Draw a neat labelled diagram of D.C. motor. [3]

c) A pulley system with velocity ratio 4 is used to lift load of 300 kgf to a vertical height of 10 m by applying an effort of 100 kgf downwards.
(i) Draw the arrangement of pulley system showing the load 'L', effort 'E' and tension 'T' in each strand.
(ii) Find the efficiency of pulley system and the work done by the effort. [4]

**Question 9**

a) (i) When does the nucleus of an atom become radioactive?

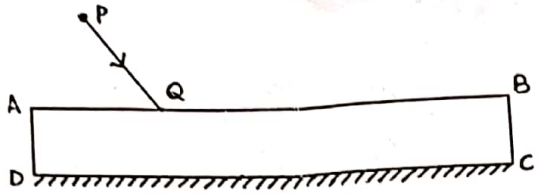
(ii) How is the radioactivity of an element affected when it undergoes a chemical change?

(iii) Name the product of nuclear fission which is utilized to bring about further fission of $^{235}_{92}U$. [3]

b) (i) Define calorimetry.

(ii) How much heat energy is absorbed from the surroundings, if a 5 kg mass of ice at $-10^0C$ completely melts to form water at $0^0C$? (Specific heat capacity of ice is 2100 $Jkg^{-1}K^{-1}$ and specific latent heat of fusion of ice is 336000 $Jkg^{-1}$) [3]

c) (i) The diagram below shows a ray of light PQ coming from an object P and incident on the surface of a thick glass plane mirror ABCD. Copy the diagram and complete it to show the formation of three images of the object P as formed by the mirror.




(ii) Which image will be the brightest image? [4]

**Question 10**

a) Arrange α, β and γ rays in ascending order with respect to their

(i) Biological effect

(ii) Penetrating power

(iii) Ionising power [3]

b) (i) Name an apparatus other than plane mirror, which can be used to turn a ray of light through $90^0$.

(ii) Draw a labelled diagram in support of your answer. [3]

c) (i) What are mirror isobars?

(ii) Give an example of mirror isobars.

(iii) Mention any one use of radio isotopes in:

(1) Medicine

(2) Industry [4]

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