VIBGYOR HIGH

Second Preliminary Examination

2018-2019

PHYSICS

Grade: X   Max. Marks   : 80

Date : 16/01/2019   Time Allowed : 2 hours

INSTRUCTIONS:-

- 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.
- The intended marks for the questions or parts of questions are given alongside the questions.
- Section I is compulsory. Attempt any four questions from Section II.

SECTION I (40 Marks)

Attempt all questions from this section.

Question 1

a) (i) Define 1 kgf.

(ii) How is it related to the S.I. unit of force?   [2]

b) A boy uses blue colour light to find the refractive index of glass. He then repeats the experiment using red colour of light. Will the refractive index be the same or different in the two cases? Give a reason to support your answer.   [2]

c) The music system draws a current of 400 mA when connected to a 12 V battery.

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

(ii) 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 mA. At what battery voltage does the music system stop playing?   [2]

d) A certain amount of heat Q will warm 1 g of material X by 3°C and 1g of material Y by 4°C. Which material has a higher specific heat capacity? Justify your answer.   [2]

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

    (i)   penetrating power   **[2]**

    (ii) ionising power.

Question 2

a)   A man having a box on his head, climbs up a slope and covers some distance another man having an identical box walks the same distance on a levelled road. Who does more work against the force of gravity and why?   **[2]**

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

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

    (ii) 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?   **[2]**

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

    (ii) State one possible source of background radiations.   **[2]**

d)   Calculate the equivalent resistance between the points A and B.   **[2]**
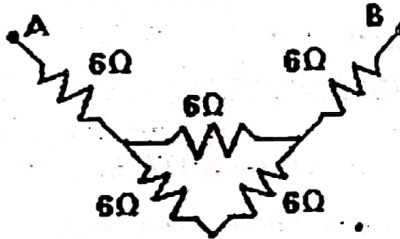
e)   Why are infrared radiations preferred over ordinary visible light for taking photographs in fog?   **[2]**

Question 3

a)   In each of the following cases where must an object be placed in front of a convex lens so that the image formed is

    (i)   inverted and enlarged

    (ii) of the same size as that of the object.   **[2]**

b)   Two friends were playing on their identical guitars whose strings were adjusted to give notes of the same pitch. Will the quality of the two notes be the same? Give reason for your answer.   **[2]**

c)   What is the relationship between the mechanical advantage and the velocity ratio for:

    (i)   an ideal machine,

    (ii) a practical machine?   **[2]**

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d) The speed of light in glass is 2×10^5 kms^{-1}. Calculate the refractive index of glass. [2]

e) (i) With reference to the direction of action, how does a centripetal force differ from a centrifugal force?

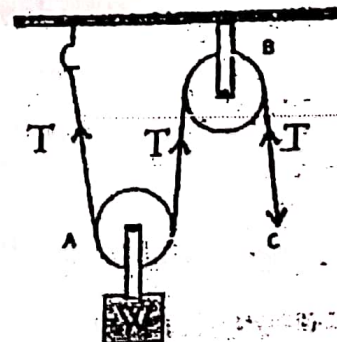(ii) Compare the magnitudes of centripetal and centrifugal force. [2]

Question 4

a) A convex lens forms an image 16 cm long of an object 4 cm long kept at a distance of 6 cm from the lens. The object and the image are on the same side of the lens. Find:

(i) the distance of the image,

(ii) the focal length of the lens. [2]

b) (i) Name the device you will use to obtain 220 V a.c from 11 V a.c.

(ii) Draw a labelled diagram of the device. [2]

c) State the effect of adding impurities:

(i) on the melting point of ice,

(ii) on the boiling point of water. [2]

d) State two conditions for a body, acted upon by several forces, to be in equilibrium. [2]

e) (i) What is an ohmic resistor?

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

SECTION II (40 Marks)

Attempt any four questions from this section.

Question 5 [3]

a) The diagram alongside shows a pulley arrangement.

(i) What kind of pulleys are A and B?

(ii) State the purpose of pulley B.

(iii) What effort has to be applied at C to just raise the load L= 20 kgf? (Neglect the weight of pulley A and friction.)

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b) Complete the following sentences:

(i) A stone tied at the end of a string when whirled in a circular path with a uniform speed is in _____ equilibrium.

(ii) A scissors is a _____ multiplier.

(iii) The centre of gravity of a hollow cone of height h is at a distance x from its vertex where the value of x is _____. [3]

c) A truck driver loads some oil drums into a truck by lifting them directly. Each drum has a mass of 80 kg and the platform of the truck is at a height of 0.8 m above the ground. ($g = 10$ ms^{-2})

(i) What force is needed to lift a drum into the truck?

(ii) How much energy is used up in lifting a drum?

(iii) After the truck is loaded, the driver drives off. List the major energy changes that take place in moving the truck.

(iv) The driver stops the truck at the factory gate. What happens to the kinetic energy of the truck? [4]

Question 6

a) (i) Name the waves used for echo depth sounding.

(ii) Give a reason for the use of the waves mentioned by you.

(iii) Why are the waves mentioned by you not audible to us? [3]

b) (i) What is the principle on which SONAR is based?

(ii) A man standing 25 m away from a wall produces a sound and receives the reflected sound. Calculate the time after which he receives the reflected sound, if speed of sound in air is 350 ms^{-1}. [3]

c) Sometimes when a vehicle is driven at a particular speed, a rattling sound is heard.

(i) Why does this happen? Explain briefly.

(ii) Name the phenomenon taking place.

(iii) Suggest one way by which the rattling sound could be stopped.

(iv) State one point of difference between forced vibrations and the phenomenon stated by you in part (ii). [4]

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Question 7

a) Study the diagram given below and answer the following questions:

(i) Name the lens LL'.

(ii) Copy and complete the diagram to form the image of the object AB.

[3]
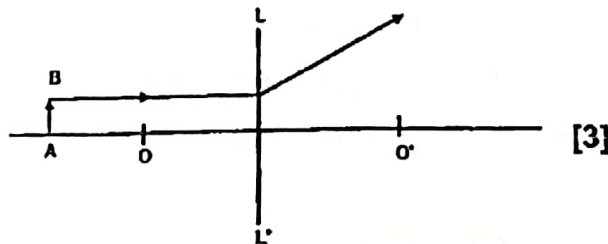
b) A beam of monochromatic light undergoes minimum deviation through an equilateral prism.

(i) How does the beam pass through the prism, with respect to its base?

(ii) If white light is used in the same way as in part (i) above, what change do you expect in the emergent beam?

(iii) What conclusion do you draw about the nature of white light in part (ii)? [3]

c) A student puts his pencil into an empty trough and is surprised observing the pencil from the position as indicated in the figure when water is poured into the trough.

(i) ·What change is observed in the appearance of the pencil?

(ii) Name the phenomenon responsible for the change.

(iii) Complete the diagram showing how the eyes see the pencil through water. [4]

Question 8

a) What will be the result of mixing 400 g of copper chips at 500°C with 500 g of crushed ice at 0°C?

Specific heat capacity of copper=0.42 $Jg^{-1}K^{-1}$,

Specific latent heat of fusion of ice=340 Jg^{-1}. [3]

b) (i) Give two reasons, why copper is preferred over other metals for making calorimetry?

(ii) How is the transference of heat energy by radiation prevented in a calorimeter? [3]

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c) (i) In winter the weather forecast for a certain day was 'severe frost'. A wise farmer watered his fields the night before. Why did he water his fields?

(ii) State in brief the meaning of each of the following:

(1) The heat capacity of a body is $50 \, J^\circ C^{-1}$.

(2) The specific latent heat of fusion of ice is $336000 \, Jkg^{-1}$. **[4]**

Question 9

a) A battery of e.m.f. 12 V and internal resistance $2 \, \Omega$ is connected with two resistors $4 \, \Omega$ and $6 \, \Omega$ respectively joined in series. Find:
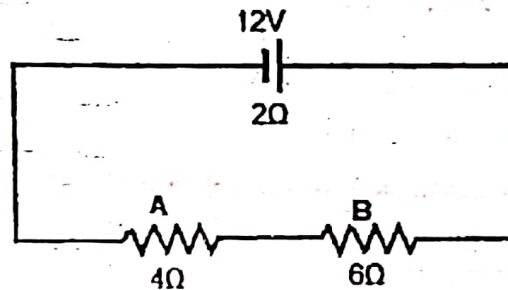
(i) the current in the circuit,

(ii) the terminal voltage of the cell,

(iii) the electrical energy spent per minute in the $4 \, \Omega$ resistor. **[3]**

b) (i) In which unit does the domestic electric meter measure the electrical energy consumed?

(ii) State the value of the above unit in its S.I. unit.

(iii) Why should switches always be connected to the live wire? **[3]**

c) (i) Name two factors on which magnitude of an induced e.m.f. in the secondary coil depends.

(ii) In the following diagram an arrow shows the motion of the coil towards the bar magnet.
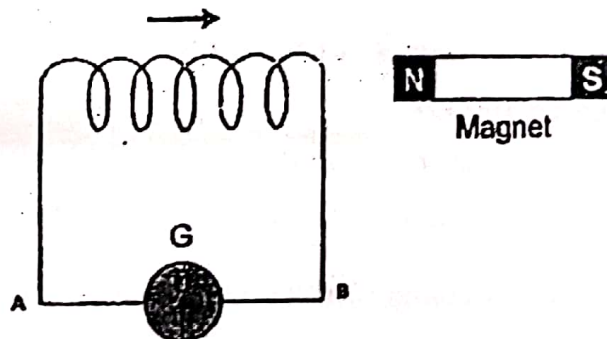
(1) State the direction in which the current flows, A to B or B to A.

(2) Name the law used to come to the conclusion. **[4]**

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Question 10

a) State one safety precaution for each of the following:

    (i)   in handling a radioactive source.

    (ii)   in the establishment of nuclear power plant.

    (iii) in the safe disposal of nuclear waste.   [3]

b)   (i)   Write Einstein's mass-energy equivalence relation.

    (ii)   What is nuclear fission?

    (iii) Write one fission reaction.   [3]

c)   (i)   Name the high energetic invisible electromagnetic waves which help in the study of the structure of crystals.

    (ii)   State an additional use of the waves mentioned in part (i).

    (iii) Which of the two $^{12}C_6$ or $^{14}C_6$ is the radio isotope? Give reason for your   [4]

    answer.

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