PHYSICS

2022 SEMESTER-2

Maximum Marks: 40

Time allowed: One and a half hours

Answers to this Paper must he written on the paper provided separately.

You will not be allowed to write during the first 10 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- A and any three questions from Section- B.

The marks intended for questions or part of questions are given in brackets [ ]

Section-A

{Attempt all questions)

Question 1.

Choose the correct answers to the questions from the given options. (Do not copy the question. Write the correct answer only.) [10]

(i) Free vibrations are :

(a) the vibrations under the influence of a periodic force

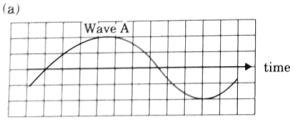
(b) the vibrations with larger amplitude

(c) the vibrations when the frequency continuously decreases

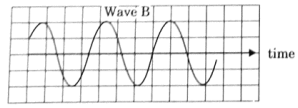
(d) the vibrations with a constant frequency and constant amplitude

(ii) The diagram below shows four sound waves. Which sound has the highest pitch?

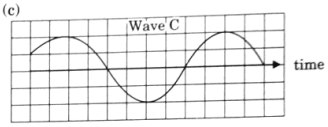
(a)



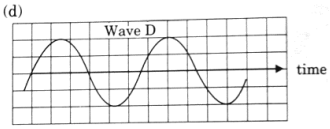
(b)



(c)



(d)



(iii) The graph plotted for potential difference (V) against current (I) for ohmic resistors is :

(a) A curve passing through the origin

(b) A straight line not passing through origin

(c) A straight line passing through origin

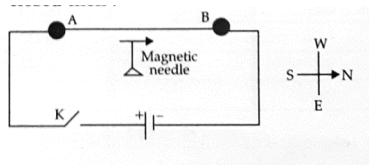
(d) A circle centred at the origin

(iv) A main switch in the main distribution board is present in :

(a) a live wire (b) a neutral wire

(c) a live as well as neutral wire (d) an earth wire

(v) A conductor AB is kept along north south direction of the earth above a magnetic needle as shown below. When the key K is closed then :



(a) the needle will not show any deflection

(b) the needle will deflect towards east

(c) the needle will turn in the opposite direction i.e. towards south

(d) the needle will deflect towards west.

(vi) A coil wound around a piece of soft iron can become an electromagnet only when :

(a) the circuit is open

(b) a magnetic compass is present in the vicinity

(c) a galvanometer is connected to the circuit

(d) a current flows in the circuit.

(vii) If water absorbs 4000 joule heat to increase the temperature of 1 kg water through 1°C then the specific heat capacity of water is :

(a) $4\ Jkg^{-1}\ °C^{-1}$ (b) $400\ Jg^{-1}\ °C^{-1}$

(c) $4\ Jg^{-1}\ °C^{-1}$ (d) $4.2\ Jg^{-1}\ °C^{-1}$

(viii) Water is used in car radiators because :

(a) it is a good conductor of heat.

(b) it conducts heat faster as compared to the other substances and cools the engine quickly.

(c) its specific heat capacity is very low.

(d) its specific heat capacity is very high so it can cool the engine without a greater increase in its own temperature

.

(ix) The heaviest nuclear radiation is :

(a) X-radiation (b) α-radiation

(c) γ-radiation (d) β-radiation

(x) To study the age of excavated material of archaeological significance we study the rate of decay of an isotope of:

(a) Uranium (b) Cobalt

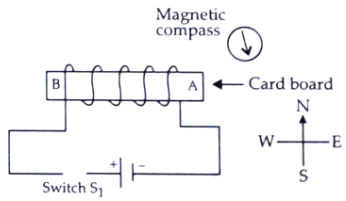
(c) Carbon (d) Chlorine

Section-B

(Attempt any three questions from this Section.)

Question 2.

(i) The diagram below shows a magnetic compass kept closer to a coil AB wound around a hollow cylindrical cardboard : [3]



(a) After studying the circuit and the magnetic compass carefully, state whether the switch S1 is open or closed.

(b) How did you arrive at the conclusion in (a)?

(c) What is the purpose of placing the magnetic compass in the above setup?

(ii) (a) Give an important reason for copper to be used as a material for a calorimeter.

(b) Calculate the thermal capacity of 40 g of water. [Specific heat capacity of water = 4200 $Jkg^{-1}\,°C^{-1}$.]

In the above circuit diagram, calculate :

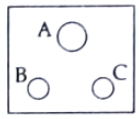
(a) the external resistance of the circuit

(b) the current I_2

(c) the current **I.**

Question 3.

(i) Three wires with proper colour coding are connected to the three terminals of a three pin socket. Match the colour of the wire with the proper terminals A, B and C of the socket. [3]



(a) Brown
(b) Green
(c) Light blue

(ii) (a) Why does it become colder after a hailstorm than during or before the hailstorm?
(b) "If two bodies have the same specific heat capacities, then they will always absorb the same amount of heat if their temperature increases by the same amount.' State whether the given statement is true or false. [3]

(ii) A metal piece of mass 420g present at 80°C is dropped in 80g of water present at 20°C in a calorimeter of mass 84g. If
(iii) the final temperature of the mixture is 30°C then calculate the specific heat capacity of the metal piece. [Specific heat capacity of water = $4.2\ Jg^{-1}\,°C^{-1}$.

(Specific heat capacity of the calorimeter = $200\ Jkg^{-1}\,°C^{-1}$))

Question 4.

(i) Rohit playing a flute and Anita playing a piano emit sounds of same pitch and loudness. [3]

(a) Name one characteristic that is different for waves from the two different instruments.

(b) If now the loudness of the sound from flute becomes four times that of the sound from piano, then write the value of the ratio $A_F : A_p$. (A_F amplitude of sound wave from flute, A_p amplitude of sound wave from piano)

(c) Define 'Pitch' of a sound.

(ii) (a) Name two factors on which the force experienced by a conductor carrying current, placed in a magnetic field, depends. Also state how these factors affect the force.

(b) With the help of which rule you can determine the direction of force acting on account carrying conductor placed In a magnetic field? [3]

(iii) (a) What is nuclear energy?

(b) After omission of a nuclear radiation, tho atomic number of the daughter nucleus increases by 1. Identify the nuclear radiation.

(c) Write a nuclear reaction indicating the nuclear change mentioned in (b).

(d) What is the special name given to the parent and daughter nucleus when this radiation is emitted? [4]

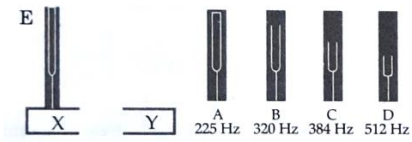
Question 5.

(i) An appliance rated 440 W, 220V is connected across 220V supply. [3]

(a) Calculate the maximum current that the appliance can draw.

(b) Calculate the resistance of the appliance.

(ii) The diagram below shows a vibrating tuning fork E mounted on a sound box X. When the vibrating tuning forks A, B, C and D are placed on the sound box Y one by one, it is observed that a louder sound is produced when the tuning fork B is placed on Y.

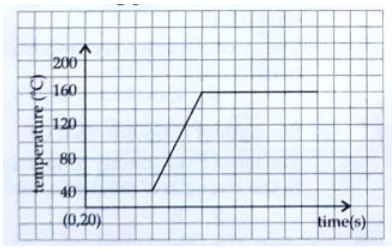


[3]

(a) What is the frequency of tuning fork E?

(b) Why does B produce a louder sound?

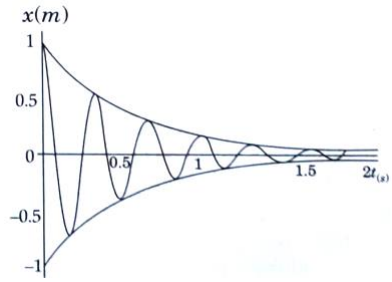
(iii) (a) From the graph of heating curve given below state the melting point and boiling point of the substance. [4]



(b) Complete and rewrite the following nuclear reaction by filling the blanks.

$$^{235}_{\cdots\cdots}U \rightarrow {}^{\cdots\cdots}_{90}Th + {}^{4}_{2}He$$

Question 6.



(i) Study the above figure and answer the following: [3]

(a) What type of vibration does the above figure represent?

(b) State one reason for which the amplitude of the vibration decreases with time.

(c) Write an example of natural vibrations.

(ii) A certain beam of α particles, β particles and γ -radiations travel through a region Of electric field produced between two oppositely chanted parallel plates A(+) and B(-). [3]

(a) Which of the above three has the maximum speed?

(b) Which one deviates the most from its original path?

(c) Which one does not deviates at all when passing through a region of electric or magnetic field?

(iii) If a wire of resistance 2 Ω gets stretched to thrice its original length: [4]

(a) Calculate the new resistance of the wire.

(b) What happens to the specific resistance of the wire?