HOLIDAY PACKAGE OF PHYSICS FOR S3

1.a) What is meant by term:

i. Latent heat of fusion **(1 mark)**

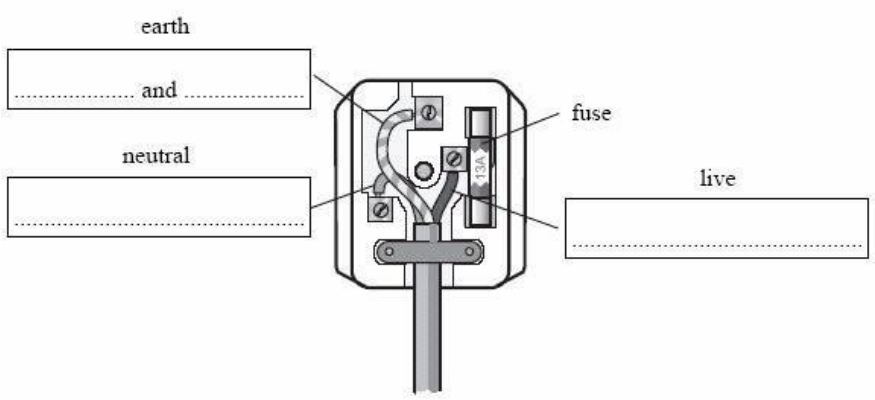
ii. Latent heat of vaporization **(1 mark)**

b)State two factors which affect the rate of evaporation of a liquid without heating it. **(1 mark)**

c)The temperature of water is recorded every minute as the water is heated from 23 ^{0}C to boiling point of 98^{0}C. The heat is maintained until half of the water evaporates. Sketch the shape of the temperature time graph of the heated water. **(2 marks)**

2.If the mass of water is 2 kg, how much heat energy is required to evaporate water completely (Specific latent heat of steam = 2260 000 J/kg and specific heat capacity of water = 4 200 J/kg. K) **(5 marks)**

3.(a) The diagram shows a correctly wired 3-pin plug. Label the wires with the correct colors.



The table shows information about some household electrical appliances.

appliance	**power**	**current**
table lamp	100 W	0.40 A
clothes iron	2.2 kW	8.8 A
television set	80 W	0.32A

i)The mains cable for the iron is thicker than the mains cables for the other two appliances. Suggest **two** reasons for this. **(2marks)**

ii)The three appliances are switched on for 30 minutes. Which costs the least to run? Explain your answer **(2marks)**

iii) The iron is switched on for 30 minutes. Calculate the electrical energy used in kWh

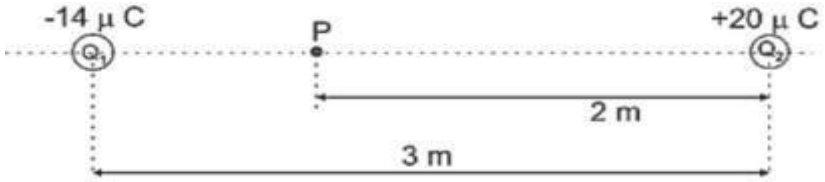
4.Two identical polystyrene spheres, A and B, each covered with a thin layer of graphite, have masses of 5.00×10^{-6} kg each and carry identical positive static charges. They are placed in a narrow vertical glass test tube, with sphere B remaining suspended 50.0 mm above sphere A.

(a) i) Draw a diagram of the electric field patterns between A and B. **(2marks)**

ii) Calculate the magnitude of the charge on each sphere. **(2marks)**

b)If the charge on the spheres gradually leaked away, what would happen to sphere B during the process? Explain your answer**. (2marks**

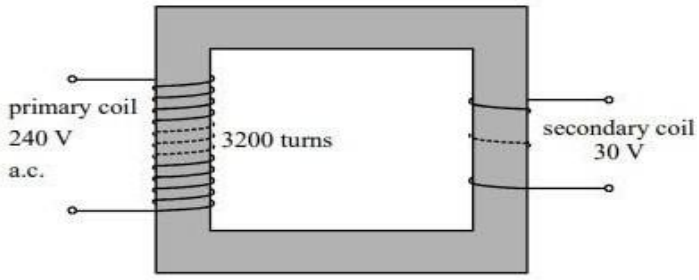
c)Two-point charges, Q_1 and Q_2, at a distance of 3 m apart, are shown below. The charge on Q_1 is –14 μC and the charge on Q_2 is +20 μC.



(i) Define the electric field strength at a point **(2marks)**

(ii) Calculate the net (resultant) electric field at point P situated 2 m from Q_2 **(2marks)**

5.A computer printer operates at 30 V. The diagram shows the transformer used to step down the mains voltage from 240 V to the 30 V needed by the printer. There are 3200 turns on the primary coil. primary coil 240 V a.c. secondary coil 30 V.



(a)What is a transformer **(2marks)**

(b)(i) Calculate the number of turns on the secondary coil **(3marks)**

(ii) The current in the printer is 0.4 A. Calculate the energy supplied to the printer in one second **(2marks)**

iii) The energy supplied to the transformer by the mains in one second is 15 J. Calculate the efficiency of the transformer **(3marks).**

iii)Explain why the primary coils should be made of thicker wire than that of the secondary coils. **(1mark)**

iv)What is the type of the transformer in figure above? **(2marks)**

6.State the first law of thermodynamics

b. A gas in a system has constant pressure. The surroundings lose 49 J of heat to the system and does 316 J of work onto the system. What is the change in internal energy of the system?

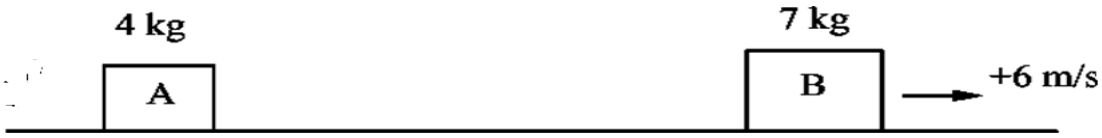
c.Two students solved the following thermodynamics problem:
"In a certain process, 523.6 J of heat is added to a system, and the system does 781.4 J of work on the surroundings." Student A concluded that the change in internal energy is 445.2 J and Student B concluded that the change in internal energy is -257.8 J. Evaluate the two answers and determine which student is correct. Justify your reasoning using the first law of thermodynamics

7.a. Explain how "electromagnetic induction" is applied in a "moving coil microphone".

b. A generator with a circular coil of 80 turns of area 3.0×10^{-2} m^2 is immersed in a 0.20 T magnetic field and rotated with a frequency of 50 Hz. Find the maximum emf which is produced during a cycle.

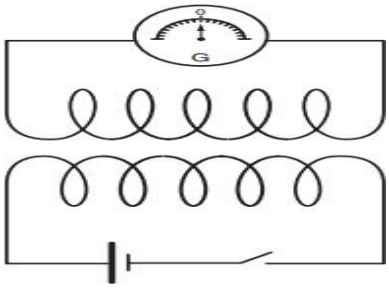
8.Three charges are arranged such that a charge of Q_1 is 2.0×10^{-6} C, Q_2 is -1×10^{-6} C and Q_3 is 1×10^{-6} C when Q_1 and Q_3 are 1.0 m from Q_2. Find the force on the charge Q_2. ($k = 9 \times 10^9 Nm^2/c^2$).

9. A body A of a mass 4 kg moves to the left with a velocity of 7 m/s collides another body B of mass 7 kg which is at rest after collision a body B moves to the right with a velocity of 6 m/s.



Find the direction and velocity of A

10. Two coils are placed near each other as shown in Figure below.



What happens to the needle of the galvanometer

a) On closing the switch? **(1mark)**

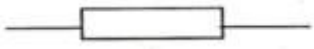
b) If the switch is kept closed? **(1mark)**

c) On opening the switch? **(1mark)**

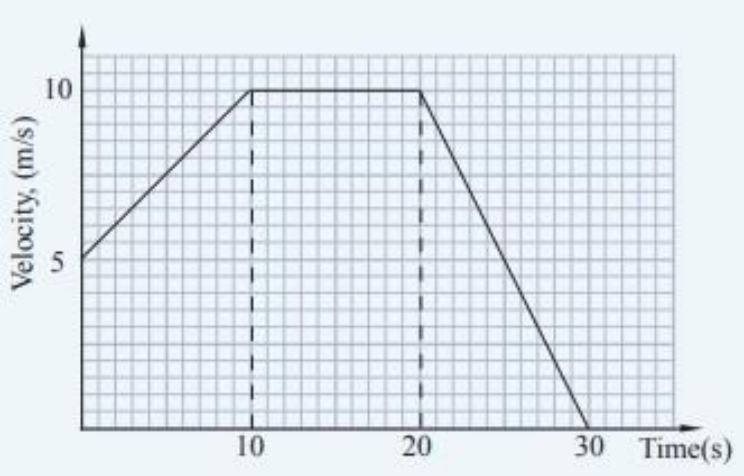
d) Give two possible ways of increasing the deflection in the galvanometer

11.a)A coil of 200 turns and area 0.01 m² rotates in a magnetic field of 0.5 T at 50 revolutions per second**.** Calculate the maximum induced emf**. (2marks)**

Identify the common electrical symbols below and its use **(8 marks)**

Symbol	Name	Use
		
		
		
		

12. Figure below represents the velocity-time graph of a body during a period of 30 s.



a)Use the equations of motion to find the displacement of the body in 30 s.

b)Use the graph to determine the displacement of the body in 30 s. **(4marks)**

c)What is the retardation of the body? **(2marks)**

13.a) The atmospheric pressure in a particular day in Kigali was measured as 740 mmHg. Express this $Nm^{-2.}$ (Assume density of mercury is 13600 kgm^{-3} and g = 10 N/kg **(3marks)**

b) A senior three student plans to make a barometer using sea-water of density 1025 kgm^{-3}. If the atmospheric pressure is 104 000 Nm^{-2}, what is the minimum length of the tube that the student will require? **(3marks)**

14. a)Solar energy has provided almost all the sources of energy on the earth. Explain. **(4marks)**

b)A steel marble at room temperature was placed in a plastic-foam cup containing ice and water at 0 °C. After thermal equilibrium was reached, the temperature of the ice-water mixture and marble was 1 °C.

i)Which object lost heat energy? **(2marks)**

ii)Was any work done on the marble or by the ice? **(2marks)**

15. Did the internal energy of the marble increase or decrease? What was a measurable effect of this change? **(2marks)**

a) Did the internal energy of the water-ice mixture increase or decrease? How can this be observed? **(2marks)**

b) Did the internal energy of the system consisting of the water-ice mixture and the marble increase or decrease? **(2marks)**