SENIOR FOUR PHYSICS QUESTIONS WAHSK

1. (a) (i) Define pressure and state its S.I unit. (*02 marks*)
   (ii) State two factors that affect pressure of liquids. (*02 marks*)
   (iii) Explain how the above factors affect pressure in liquids. (*02 marks*)

   (b) A cylindrical tank of radius 1.4m and height 5m is half - filled with water. Calculate
   (i) the thrust exerted by the water at the base of the tank. (*02 marks*)
   (ii) the pressure exerted by the water at the base of the tank. (*02 marks*)

   (c) (i) Define radiation as applied to heat. (*01 mark*)
   (ii) Two flasks with a manometer are arranged as shown in Figure 1. Flask A is painted black while flask B is polished white. A flame is then placed midway between them.

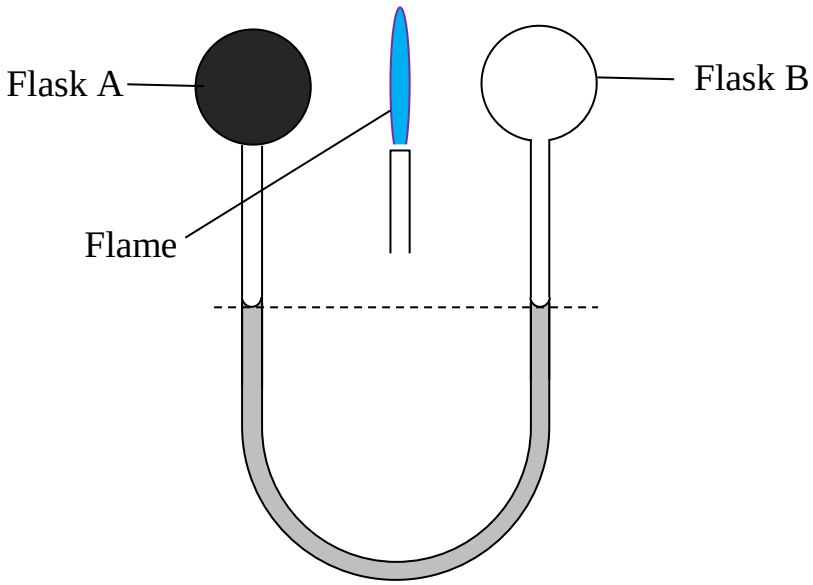

Figure 1

   (i) State what is observed. (*01 mark*)
   (ii) Explain your observation. (*04 marks*)

2. (a) (i) Define surface tension. (*01 mark*)
   (ii) Describe an experiment to show the existence of surface tension in liquids. (*04 marks*)

(iii) Use kinetic theory to explain the existence of surface tension in liquids. (*03 marks*)

(b) (i) A steel ball is placed centrally on the surface of a viscous oil in a tall jar. Describe the motion of the ball. (*03 marks*)

(ii) Sketch a velocity – time graph for the motion of the ball. (*01 mark*)

(iii) If the steel ball has a volume of $1cm^3$ and a density of $7500kgm^{-3}$, and the oil has a density of $1500kgm^{-3}$, maximum viscous force on the ball. (*04 marks*)

3. (a) State two similarities between cathode rays and x – rays. (*02 marks*)

(b) (i) Draw a labelled diagram of an x – ray tube. (*02 marks*)

(ii) Describe how x – rays are produced in an x – ray tube. (*04 marks*)

(iii) State one medical use and one industrial use of x – rays. (*02 marks*)

(c) (i) A radioisotope, $^{216}_{84}P$, decays by emission of β – particle to an element, Q. Element, Q then decay to an element, R by emission of an α – particle. Write the equations for these nuclear reactions. (*02 marks*)

(ii) An element X has a half – life of 15 seconds. At the beginning, there were 3.2×10^{10} atoms of element X present that are radioactive. How many atoms will still be radioactive after 2 minutes? (*04 marks*)

4. (a) (i) State the laws of refraction. (*02 mark*)

(ii) On a hot sunny day, a person is able to see a mirage. Explain how mirage is formed. (*05 marks*)

(b) Describe an experiment to determine the refractive index of water in a beaker. (*05 marks*)

(c) A monochromatic light is incident at a glancing angle of 15^o on a semi – circular glass block as shown in Figure 2.

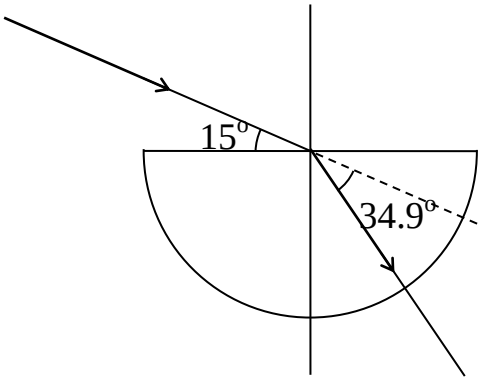

Figure 2

Find the refractive index of the glass. (*04 marks*)

5. (a) Define the **volt**. (*01 mark*)

(b) A piece of polythene was cut into strip as in Figure 3 and rubbed with paper tissue.

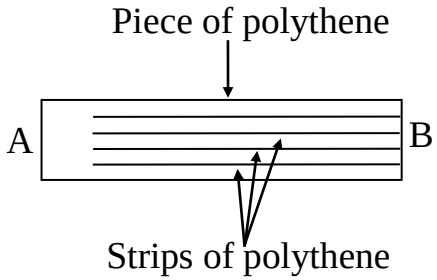

Figure 3

(i) State what would be observed when the piece of polythene is lifted while holding end A. (*01 mark*)

(ii) Explain your observation in (b)(i) above. (*02 marks*)

(c) You are provided with a dry cell, a voltmeter, an ammeter, and a resistor of known resistance, R. Describe how you used this equipment to determine the internal resistance, *r* of the cell.
(*03 marks*)

(d) A battery of e.m.f of 25V and internal resistance, ***r*** is connected to resistors of 6Ω, 3Ω and 8Ω as shown in Figure 4. The current flowing in the 3Ω resistor is then 1.6A.

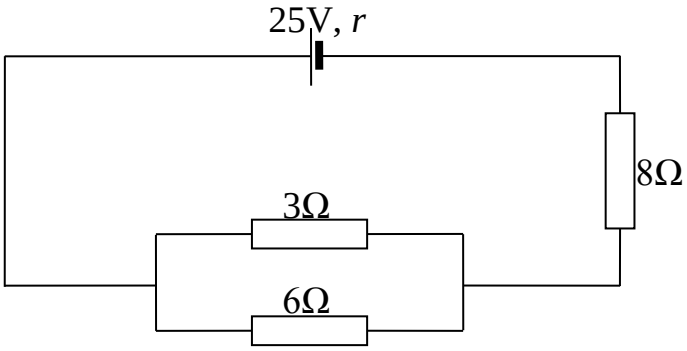

Figure 4

Calculate

(i) the current in the 6Ω resistor. (*03 marks*)

(ii) the power dissipated in the 8Ω resistor. (*02 marks*)

(iii) the internal resistance, ***r***. (*02 marks*)

6. (a) What is **ultrasound**? (*01 mark*)

(b) Ultrasound is used for detecting other sea vessels and to measure the depth of the sea. Explain briefly how it is used for the two purposes. (*04 marks*)

(c) An open tube was used to produce harmonics. When air was blown into the tube, it was noted that the frequency of the fundamental tone is 256Hz.

(i) What is the frequency of the second harmonics? (*02 marks*)

(ii) If the speed of sound in air is $320ms^{-1}$, what length of tube would produce this harmonics? (*03 marks*)

(d) Describe an experiment to show that sound is a mechanical wave. (*06 marks*)

7. (a) Define the following terms:

(i) Heat. (*01 mark*)

(ii) Temperature. (*01 mark*)

(b) Most domestic refrigerators today have their freezing compartment at the bottom unlike previous domestic refrigerators that had their freezing compartment at the top.

(i) How are the content of the upper compartment of today domestic refrigerators cooled? (*02 marks*)

(ii) Of what advantage is this new arrangement compared to the previous one? (*02 marks*)

(c) Figure 5 shows the main parts of a refrigerator.

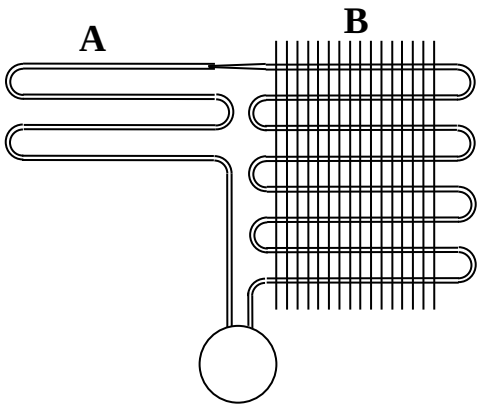

Figure 5

(i) Describe what happens in the parts labelled **A** and **B**. (*04 marks*)

(ii) Explain why **B** made of the material it is made of and painted with the colour it is painted with? (*02 marks*)

(d) 4kg of water at 20^{o}C is placed in a refrigerator. After 2 hours, 13 minutes and 20 seconds, all the water had changed to ice at 0^{o}C. Find the rate at which heat is removed from the water. (*04 marks*)

8. (a) State the laws of **electromagnetic induction**. (*02 marks*)

(b) (i) What is an electromagnet? (*01 mark*)

(ii) State two ways of increasing the strength of an electromagnet. (*02 marks*)

(c) With the aid of a labelled diagram, describe the action of a moving coil loud speaker. (*05 marks*)

(d) (i) UMEME is delivering 100kW of power to a factory and transmitting it at 250V through wires of resistance of 0.1Ω. What power is lost in the wires? (*04 marks*)

(ii) What advice would you give UMEME to reduce the power lost in transmission and why? (*02 marks*)

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