K.C.S.E PHYSICS PAPER 232/1 2005

SECTION A

Answer all the questions

1. **Figure 1.** shows the reading on a burette after 55 drops of a liquid have been used

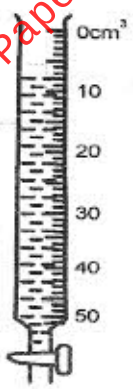


Figure 1.

If the initial reading was at zero mark, determine the volume of one drop (2 marks)

2. **Figure 2.** shows a solid cylinder standing on a horizontal surface. The cylinder is in stable equilibrium.

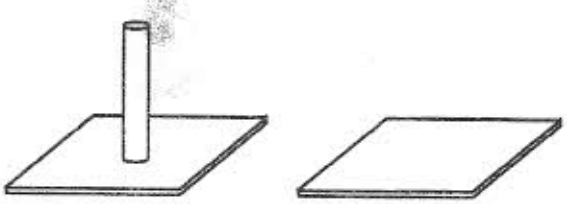


Figure 2.

On the horizontal space provided, sketch the cylinder in neutral equilibrium (1 mark)

3. The light uniform bar in **Figure 3.** is in equilibrium. The two beakers A and B contain water at the same temperature. The two blocks are made of the same material.

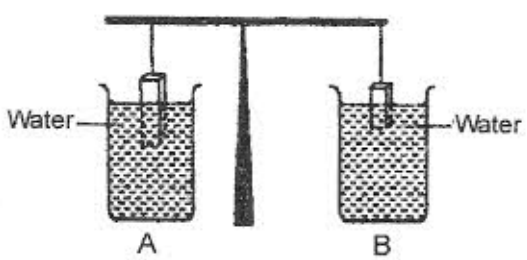


Figure 3.

If the temperature of the water in beaker A is now raised, explain why the beam tips to side A. Assume the solid does not expand. (2 marks)

4. A can with a hole on the side is filled with water to a certain height. Water jets out as shown in **Figure. 4(a).** A second identical can is filled with water to the same height and a block of wood floated on the water as shown in **Figure 4(b).**

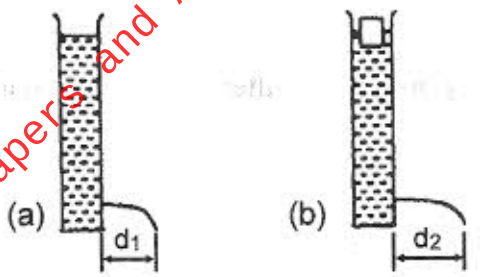


Figure 4(a) and (b)

State the reason why the maximum distance of the jet, d_2 is greater than d_1 (1 mark)

5. In a vacuum flask the walls enclosing the vacuum are silvered on the inside. State the reason for this. (1 mark)

6. **Figure 5.** shows an arrangement of a source of light, an opaque object and a screen.

Figure 5

State on the same figure a labelled ray diagram to show what is observed on the screen (2 marks)

7. Two identical tubes A and B held horizontally contain air and water respectively. A small quantity of coloured gas is introduced at one end of A while a small quantity of coloured water is introduced at one end of B. State with reason the tube in which the colour will reach the other end faster. (2 marks)

8. Sketch the electrostratic field pattern due to the arrangement of the charges shown in **Figure 6** (1 mark)

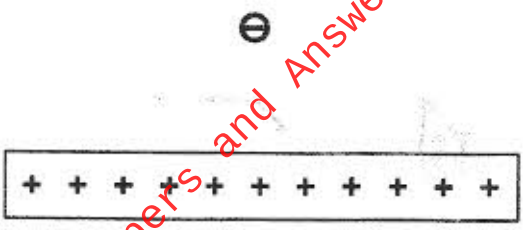


Figure 6.

Figure 7. shows the feature of a dry cell (Lechlanche). Use the information in the figure to answer question 9 and 10.

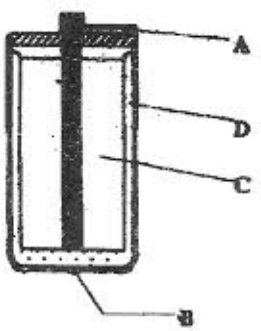


Figure 7

9. State the polarities of the partslabelled A and B. (1 mark)

A

B

10. Name the chemical substances in the parts labelled C and D. (2 marks)

C

D

11. **Figure 8.** shows water drops on two surfaces. In 8(a), the surface is glass smeared with wax while in 8 (b) the surface is clean glass.

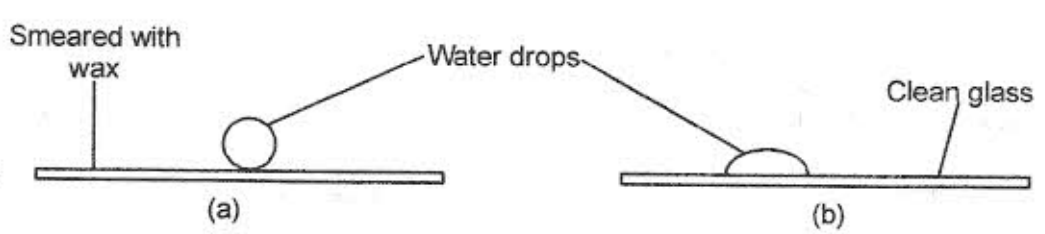
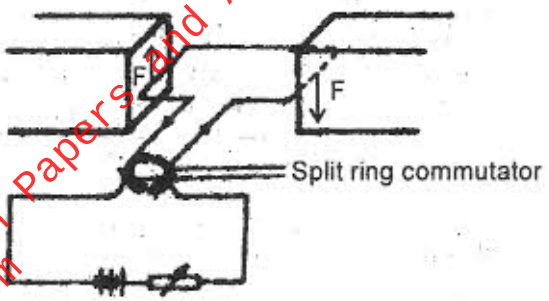


Figure 8

Explain the difference in the shapes of the drops. (2 marks)

Figure 9. shows a current carrying coil in a magnetic field. The direction of the current and the resulting force are shown. Study the figure and answer questions 12 and 13.

Figure 9.



12. Label the poles of the magnets (1 mark)

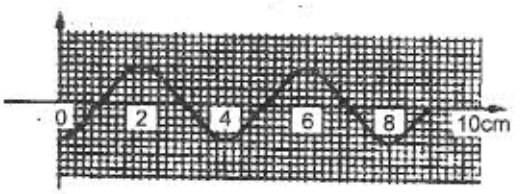
13. Explain the purpose of the split ring commutator in the principle of the D.C. motor shown in the diagram. (2 marks)

14. A bullet is fired horizontally from a platform 15 m high. If the initial speed is $300ms^{-1}$, determine the maximum horizontal distance covered by the bullet (3 marks)

15. A certain machine uses an effort of 400N to raise a load of 600N. If the efficiency of the machine is 75%, determine its velocity ratio. (3 marks)

16. **Figure 10.** represents a transverse wave of frequency 5 Hz travelling in the *x* direction

Figure 10



Determine the speed of the wave. (3 marks)

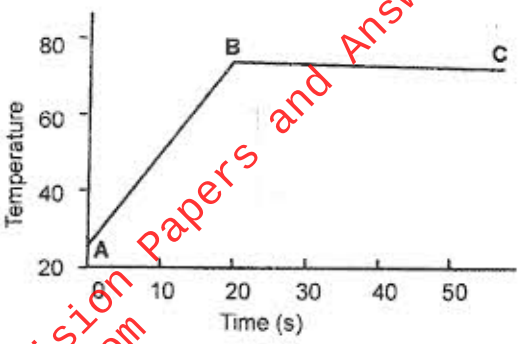
17. An electronic given producing sound continuously at a certain frequency is dropped from the top of a deep hole. State and explain what is observed about the pitch of the sound reaching the observer at the top. (3 marks)

18. A student wishes to investigate the relationship between current and voltage for a certain device **X**. In the space provided, draw a circuit diagram including two cells, rheostat, ammeter, voltmeter and the device **X** that would be suitable in obtaining the desired results. (1 mark)

19. A hair drier is rated 2500 W, 240V. Determine its resistance (3 marks)

Figure 11. shows the variation of temperature, θ, with time t, when an immersion heater is used to heat a certain liquid. Study the figure and answer questions 20 and 21

Figure 11.

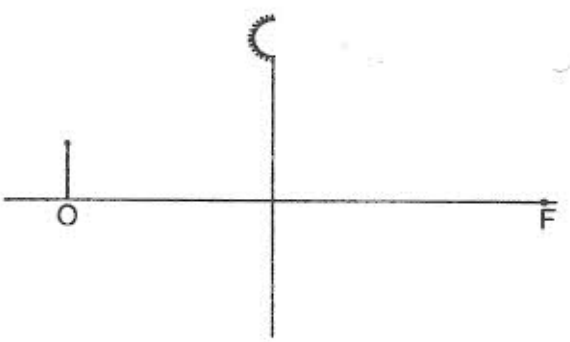


20. State the reason for the shape of the graph in the section labelled BC. (1 mark)

21. Sketch on the same axes the graph for another liquid of the same mass but higher specific heat capacity when heated from the same temperature. (1 mark)

22. **Figure 12.** shows a vertical object, O, placed in front of a convex mirror.

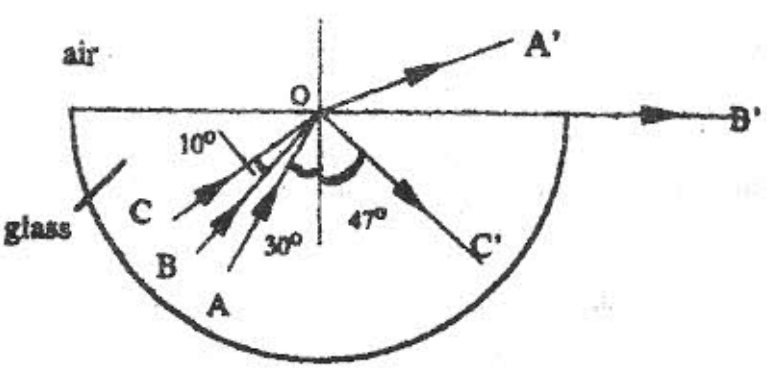
Figure 12



On the same diagram draw the appropriate rays and locate the image formed. (3 marks)

Figure 13. shows rays of light AO, BO and CO incident on a glass-air interface. OA^1, OB^1 and OC^1 are the corresponding emergent rays. Study the figure and answer questions 23 and 24.

Figure 13



23. Determine the critical angle of the glass material. (1 mark)

24. Determine the refractive index of the glass material (3 marks)

25. **Figure 14.** shows the velocity-time graph for a small metal sphere falling through a viscous fluid

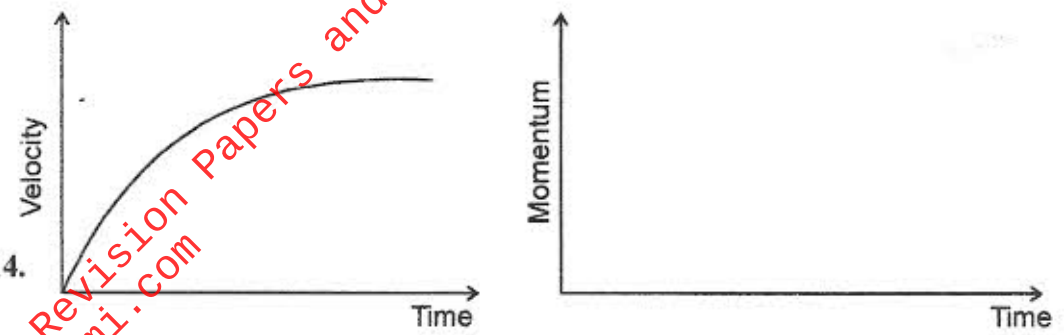


Figure 14.

On the same axes sketch the graph of momentum against time for the same mass (1 mark)

26. State Bernoulli's principle (1 mark)

27. The melting point of oxygen is given as -281.3°C. Convert this temperature to Kelvin (K). (1 mark)

28. **Figure 15.** shows an arrow which indicates the direction of travel of a wave in a medium. P is a particle of the medium that is in the path of the wave.

(i) (ii)

Figure 15.

In the space provided sketch diagrams to show how the particle P moves when the wave is

(i) a transverse wave (ii) a longitudinal wave (1 mark)

29. A car of mass 800 kg moves on a circular track of radius 20 m. The force of friction between the tyres and the tarmac is 4800 N. Determine the maximum speed at which the car can be driven on the track without skidding (3 marks)

30. An illuminated vertical object is initially placed on the principal axis of a converging lens and 32cm from it. The focal length of the lens is 15cm. The object is now placed at a point 12cm from the lens and on the same side. State two change other than magnification that are observed on the image formed due to this change (2 marks)

31. Explain how an 'excited' hydrogen atom is able to emit radiations of different wavelengths.
(2 marks)

32. **Figure 16.** shows wavefronts in a ripple tank approaching a shallow region in the tank.

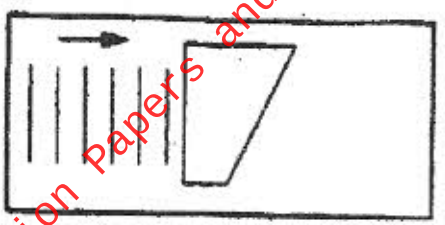


Figure 16

Complete the diagram to show the wavefront as they pass over the shallow region and after leaving the region.
(1 mark)

33. The target of an X-ray tube is made of metals of high melting point. Give a reason for this.
(1 mark)

34. Explain why a drop of methylated spirit placed on the back of the hand feels colder than a drop of water although at the same temperature.
(2 marks)

35. Draw using appropriate symbols the circuit diagram of a junction diode in reverse bias.
(1 mark)

36. The following represents a nuclear reaction involving the nucleid polonium (Po)

$$^{218}_{84}Po \xrightarrow{m} {}^{214}_{82}Pb \xrightarrow{n} {}^{214}_{83}Bi \longrightarrow {}^{214}_{84}X$$

Identify m, n and X
(3 marks)

m

n

X

37. In the set up in **Figure 17**. the metal rod is made up of steel and iron pieces joined end to end. You are provided with two iron nails.

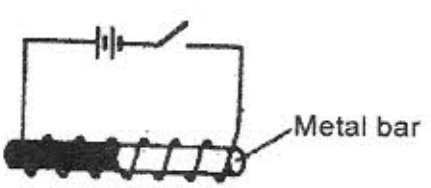


Figure 17

Explain how you would use the nails to determine which side is iron.
(2 marks)

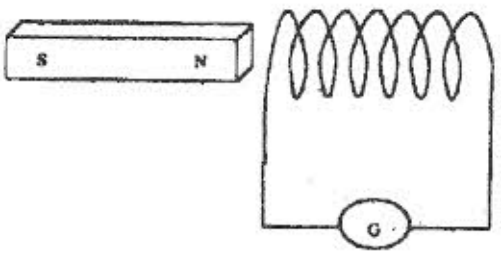
38. **Figure 18.** shows two spherical materials one a conductor, the other an insulator. Negative charges are introduced at point A in each case.

Figure 18

On the same figure indicate the final position of the charges (2 marks)

39. In the set up in **Figure 19.** the magnet is moved towards the coil and stopped when inside the coil.

Figure 19



It is observed that the galvanometer defects to one side and then goes back to zero. Explain this observation (2 marks)