1. What is **Physics**? (2mk)
2. Differentiate fundamental quantities from derived quantities and give an example of each
3. State what the following branches of physics deals with:
4. Mechanics
5. Electricity and magnetism
6. Thermodynamics
7. Geometric optics
8. Waves
9. Atomic physics
10. State and explain **two** basic laboratory safety rule
11. State the **SI** units of the following quantities **(3mk)**

**Length =**…………………………………………………

**Mass =**……………………………………………….

**Temperature =**………………………………………………..

1. Name two branches of physics. **(2mk)**
2. Name two career opportunity in physics. (2mk)
3. State the relationship between physics and the following subjects.
	1. Biology (1mk)
	2. Geography (1mk)

**LENGTH AND AREA**

1. Convert the following values into **SI** units

 **(i) 86400cm2  (1mk)**

 **(ii) 204000cm3  (1mk)**

1. A student measured the length of a wire four times using a meter rule and obtained the following readings: **18.6cm**; **18.5cm**; **18.6cm**; and **18.5cm**. Determine the length the student should record. (2mk)
2. The figure below shows a section of a meter rule used to measure length of a piece of wood.

**6**

**7**

**8**

**9**

**10**

**cm**

**Wood**

 Find the length of the wood (2mk)

1. In an experiment to estimate the height of a tree using its shadow, a ruler of height **100cm** is placed next to the tree as shown below. If the ruler and the tree forms shadows of **150cm** and **750cm** respectively.

**150cm**

**100 cm**

**h**

**750cm**

**Tree**

**Ruler**

**Tree Shadow**

**Ruler Shadow**

Calculate the height **h** of the tree. (3mk)

1. A Figure below is an arrangement of two set squares and a rule being used to determine the external diameter of a cylinder.

**8**

**9**

**10**

**Cylinder**

1. State the accuracy of the rule. (1mk)
2. What is the radius of the cylinder? (2mk)
3. A thin wire was wound **10** times closely over a boiling tube. The total length of the wire wound around was found to be **440mm**. Calculate the radius of the boiling tube in **SI** units.

**Thread**

**Cylinder**

1. A thin wire was wound **30** times closely over a boiling tube. The total length of

 the windings was found to be **9.3 mm**. Calculate the radius of the wire.

1. A length of 550cm of them thread wraps around a cylindrical tin exactly

 25times. Calculate the radius of the cylinder (2mks)

1. The figure below shows a half spherical bowl of radius **3cm**. calculate its volume.
2. The figure below shows the map of a school compound. Each square is equivalent to **1cm2**. Calculate the total area covered by the school on the map. (3mk)

1. Express the area of land of **0.0025km2** in **S.I** units and in standard form

**VOLUME**

1. Define volume and give its **SI** units.
2. Find the volume of a spherical ball of radius **3cm**. **(3mk)**
3. Calculate the volume of a Cuboid that measures **4cm** by **5cm** by **3cm** in **SI** Units.
4. Find the capacity of a cylinder of radius **70cm** and height **20cm** in litres.
5. A sphere of radius **6cm** is moulded into a thin cylindrical wire of length **32cm**. Calculate the radius of the wire in SI Units.
6. A solid Cuboid of dimensions **11cm x 14cm x 5cm** is melted in to a cylindrical solid of diameter **28** **cm**. calculate the height of the cylinder
7. A cylinder of height **25cm** is completely melted and a sphere of the same radius made. Determine the radius of the sphere in metres and express your answer in ***standard form***. (3mk)
8. The figure below shows a block of mass **360g**.

**2cm**

**12cm**

**5cm**

 Calculate the

(i) Volume of the block.

 **(ii)** Density of the block in **SI** unit.

1. The diagram below shows a brick of mass **120g**.The brick measures **30cm x 6cm x 4cm**. Calculate the density of the brick

**4 cm**

**6 cm**

**30 cm**

1. The figure below shows Perspex container with a base of sides **5** by **6 cm** carrying water to a height of **3cm**.

**5cm**

**6cm**

**3cm**

When pebble is immersed into the water, the level rise to **10 cm**. what is the volume of the pebble?

1. The figure below shows a cylinder of radius **10cm** and height **21cm**.

 Calculate its capacity in litres.

**21cm**

**10cm**

1. The figure below shows the change in volume of a liquid in a measuring cylinder when an irregular solid is immersed in it. Given that the mass of the solid is **75g**, determine the density of the solid in SI units.

**10**

**20**

**30**

**40**

**50**

**10**

**20**

**30**

**40**

**50**

 **cm3**

1. The figure below shows the change in volume of a liquid in a measuring

cylinder when an irregular solid is immersed in it. Given that the density of the solid is **4g/cm3**, determine the mass of the solid in SI units. (4mk)

**20**

**40**

**60**

**80**

**100**

**20**

**40**

**60**

**80**

**100**

 **cm3**

1. The figure below shows a measuring cylinder which contains water initially at a level **A**. A spherical solid of mass **11g** is immersed in the water, the level rises to **B**.

**4 cm3**

**3 cm3**

 **1 cm3**

 **2 cm3**

**B**

**A**

**5cm3**

 Determine the diameter of the spherical ball (2mk)

1. Fig shows a measuring cylinder into which an irregular stone of mass **60grams** has been immersed.

**cm3**

 **20**

**35**

 **30**

**40**

 **25**

 **45**

If the initial reading before immersing was **27cm3**. Find the density of the stone. (2mk)

1. The figure below shows water placed in a measuring cylinder calibrated in **cm3**?

**15cm3**

 **5cm3**

 **10cm3**

**20cm3**

 An object of mass **50.1g** and density **16.7g/cm3** is lowered gently into the water. Indicate on the diagram the new level. (2mk)

1. The figure below shows the level of water in a measuring cylinder after

a stone of mass **100 g** is immersed in the water. The initial level of the water is shown with a dotted line. Determine the density of the stone. (3mk)

**Initial level**

**25 ml**

**Water**

**Stone**

**75 ml**

**125 ml**

1. Ten glass marbles, each of mass 6.0 g, were gently lowered into a measuring cylinder containing water to the level marked **A**. The water level rose to the level marked **B** as shown in Fig below. Determine the density of the glass. (3mk)

**30cm3**

 **10cm3**

 **20cm3**

**40cm3**

**B**

**A**

1. The figure below shows a cylinder with water and **8** lead pellets each of volume **1.5cm3**.

**30cm3**

 **10cm3**

 **20cm3**

**40cm3**

 Indicate on the diagram the level of water if the pellets are removed. (2 mk)

1. Figure Shows a glass beaker of cross sectional area 10.5cm2

**Water**

When a metal block of mass **250 g** is immersed into the water, the level of water rises by **3.5 cm**. determine the density of the metal block. Express your answer in S.I unit (3mk)

**BURETTE**

1. **1600 cm3** of fresh water of densit**y 1 g/cm3** are mixed with **1400cm3** of seawater of density **1.25g/cm3**. Determine the density of the mixture.
2. The water level in a burette is **27cm3**. If **88** drops of water fall from the burette and the average volume of one drop is **0.25cm3**what is the final water level in the burette?
3. The initial level of water in a burette was **32cm3.**Some **20** drops of water each

 of volume **0.4cm3** are **added**. Find its final reading.

1. **1600 cm3** of fresh water of densit**y 1 g/cm3** are mixed with **1400cm3** of seawater of density **1.25g/cm3**. Determine the density of the mixture.
2. The initial level of water in a burette was **26cm3.**Some **10** drops of water each of volume **0.5cm3** are allowed to **drop out**. Find its final reading.
3. A ball bearing of volume **1.8cm3** was dropped into water contained in the burette shown in figure below. Determine the final reading of water in the burette. (2mks)

**50**

**48**

**Object**

**49**

**cm3**

1. The figure below shows the reading on a burette after 55 drops of a liquid have been used.

**20**

**50**

**30**

**40**

**cm3**

**10**

**0**

If the initial reading was at **0cm** mark, determine the volume of one drop.

1. The figure below shows a burette initially filled with water to the level marked **X**. An object of density **1.5gcm-3** is immersed into it and the level rose as shown**.** Determine the mass of the object (3mk)

**X**

**50 cm3**

**45**

**35**

**Object**

**40**

**cm3**

1. The figure below shows a section of a measuring instrument.

**35**

**30**

**50**

**40**

**45**

**cm3**

1. Name the measuring instrument shown above **(1mk)**
2. What is the volume of water in it? **(1mk)**
3. Some **24** drops of water each of volume **0.5cm3** are **added** to the instrument above. Find the final reading of the instrument.
4. In an experiment to measure the density of a liquid, a student filled a

burette with a liquid to the 0cm3 mark. The figure below shows as section of the burette showing the level of the liquid after 93.2g of the liquid had been run out.

**46**

**48**

**47**

**cm3**

1. Take the reading of the burette ………………………………………… (1mk)
2. Determine the density of the liquid. (3mk)
3. The figure (a) below shows the initial reading of a burette used to measure the volume of oil. After 50 drops of oil were run out, the final reading was as shown in (b). Determine the volume of one drop of oil (2mk)

**(a)**

**(b)**

**50**

**40**

**10**

**cm3**

**30**

**20**

 **0**

**50**

**40**

**10**

**30**

**20**

 **0**

**cm3**

 **(3mk)**

1. Figure below shows a measuring cylinder containing some water.

**47**

**50**

**48**

**49**

**cm3**

**30cm3**

**10cm3**

**20cm3**

**40cm3**

**46**

**45**

**Burette**

**Measuring**

**cylinder**

1. New reading……………………(1 mk)
2. New reading…………………….(1mk)

Another **3cm3** of water was added to the cylinder from a burette delivering volume from **0cm3** to **50cm3**. Record in the spaces provided the new reading indicated on each vessel.

1. Two burettes **A** and **B** were arranged as shown below. Burette **A** leaked into **B** at the rate of **10** drops per minute. If the initial reading on both burettes was **25cm3**. What would be their reading at the end of one hour if **B** does not leak? Volume of one drop of water is **2.0 x 10-8m3**. (3mks)

**A**

**cm3**

**25cm3**

**25cm3**

**B**

1. In an experiment to measure the radius of a wire a student cut the wire into **100** identical pieces of length **7mm** and dipped the pieces completely into a burette with initial level of liquid at **49.5cm3** mark. If the final level was at **0cm3**. Determine the radius of the wire giving your answer to two decimal places (3mks)
2. The diagram fig below shows an arrangement that a certain student set up in a physics lab without the consent of the teacher. He allowed some volume of water into the glass tube and measured the corresponding height h of water in the tube using a ruler. He tabulated his data as below.

**Burette**

***h***

**Glass tube**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Burette reading cm3** | **5.1** | **8.2** | **15.4** | **21.5** | **28.0** | **35.6** |
| **Height h, cm** | **3.8** | **5.8** | **10.5** | **14.5** | **18.7** | **23.2** |

 (a) Draw a graph of the burette reading against height h of the water in the glass tube. (5mks)

 (ii) Use your graph above to determine the area of cross section of the glass tube. (3mks)

(iii) Use your graph to determine how far the zero mark of the ruler is from the end placed on the base of the stand. (2mks)

 **DENSITY**

1. Define density and give its **SI** units.
2. The density of concentrated Sulphuric acid is **1.8gcm-3**. Calculate the volume of **3.6kg** of the acid.
3. A block of metal of mass **72g** measures **2cm x 4cm x 6 cm**, calculate the density of the metal in **SI** unit.
4. Determine the density in **SI units** of a solid whose mass is **40g** and whose dimensions in cm are **30 x 4 x 3** (**2mk)**
5. A cuboid has dimensions **12cm** by **10cm** by **15cm**. its weight is **72N**. Determine the density of the material the cuboid is made of. **(3mks)**
6. The mass of an empty density bottle is **20g**. When the bottle is full of paraffin it weighs **60g** and when full of water weighs **70g**. Calculate the density of paraffin in SI units. **(4mk)**
7. An empty density bottle has a mass of **50g**. Its mass is **100g** when filled with water and **120g** when filled with liquid **K**. Calculate the density of liquid **K** in **SI** units.
8. The mass of a density bottle is **20g** when empty, **70g** when full of water and **50g** when full of ethanol. Calculate the density of ethanol in **SI** units.
9. A density bottle has a mass of **45g** when full of paraffin and a mass of **50g** when full of water if the empty bottle weighs **25g**, calculate the relative density of paraffin.
10. The mass of an empty density bottle is **20g**. When the bottle is full of paraffin it weighs **60g** and when full of water weighs **70g**. Calculate the density of paraffin in **SI** units.
11. The mass of a density bottle is **20g** when empty **70g** when full of water and **695g** when full of another liquid. Calculate the
12. density of the other liquid (take density of water as **1g/cm3**
13. Mass o**f 20cm3**of the liquid  **(2mk)**
14. The mass of a density bottle of volume 50cm3 is 10.0g when empty. Aluminium turnings are poured into the bottle and the total mass is 60.0g. Water is then added into the turnings till the bottle is full. If the total mass of the bottle and its contents is 90.0g, calculate the density of the aluminium turnings. (3mk)
15. An empty density bottle has a mass of **23g**. When completely filled with water its mass is **39.0g**. What will be its mass if it is completely filled with an acid of relative density **1.25**? (Take the density of water as **1.0gcm-3**)
16. An empty density bottle has a mass of **30g**. When completely filled with water its mass is **70g**. What will be its mass if it is completely filled with an acid of relative density **1.6**?
17. **200cm3** of water of density **1g/cm3** is mixed with **300cm3** of milk of density **2g/cm3**. Calculate
18. The total volume of the mixture
19. The total mass of the mixture
20. The density of the mixture in **SI** units.
21. **1000cm3** of water density **1g/cm3** mixed with **2000cm3** of saturated salt solution of density **1.3g/cm3**. Calculate
22. The total volume of the mixture
23. The total mass of the mixture
24. The density of the mixture in SI units.
25. An alloy is made by mixing **80cm3** of copper of density **9g/cm3** with **120cm3** of alluminium of density **3g/cm3**. Determine the
26. Total volume of the alloy.
27. Total mass of the alloy
28. Density of the alloy in **SI** units.
29. **100cm3** of water of density **1g/cm3** is mixed with **400cm3** of ethanol of density **800kg/m3**. Calculate
30. The total volume of the mixture
31. The total mass of the mixture
32. The density of the mixture in **SI** units.
33. **400cm3** of alcohol of density **800kg/m3** is mixed with **600cm3** of water of density **1000kg/m3**. Calculate the density if the mixture in **SI** units.
34. An alloy is made by mixing **180cm3** iron metal of density **2000kg/m3** with **120cm3** of lead meal of density **4g/cm3**. Calculate the density of the alloy.
35. **400cm3** of alcohol of density **800kg/m3** is mixed with **600cm3** of water of density **1g/m3**. Calculate the density if the mixture in **SI** units.
36. **1600 cm3** of fresh water of densit**y 1 g/cm3** are mixed with **1400cm3** of seawater of density **1.25g/cm3**. Determine the density of the mixture.
37. A liquid of density **800kg/m3** has a mass of **3.2g**. Calculate its volume in **SI** unit.
38. **100cm3** of water of density **1g/cm3** is mixed with **200cm3** of ethanol of density **0.79g/cm3**. Calculate the density of the mixture in SI units.
39. **500cm3** of fresh water of density **1000 kg/m3** mixed with **1000cm3** of sea water density **1020kg/m3**. Calculate the density of the mixture in SI units.
40. An alloy is made by mixing **80 cm** of copper of density **8.9g/cm3** with **120cm3** of alluminium of density **2.7g/cm3**. Determine the density of the alloy in SI units.
41. An alloy is made by mixing **180cm3** iron metal of density **2000kg/m3** with **120cm3** of lead meal of density **4g/cm3**. Calculate the density of the alloy.
42. **400cm3** of alcohol of density **800kg/m3** is mixed with **600cm3** of water of density **1g/m3**. Calculate the density if the mixture in **SI** units.
43. **100cm3** of sea water of density **1150kg/m3** is mixed with **100cm3** of fresh water of density **1000kg/m3**. Determine density of the mixture.
44. **1600 cm3** of fresh water of density **1g/cm3** are mixed with **1400cm3** of seawater of density**1.25g/cm3**. Determine the density of the mixture.
45. An alloy contains **40%** by mass of lead and **60%** by mass of tin. Determine the density of the alloy in kgm3. (density of lead = **1.4g/cm3** and density of tin = **7.3g/cm3)** 3mks)
46. **X**cm3 of substance **A** which has a density of **800kg/m3** is mixed with**100cm3** of water with a density of **1000 kg/m3**. The density of the mixture is **960kg/m3**. Determine the value of **X**.

**MASS**

1. A butcher has a beam balance and masses **0.5 kg** and **2 kg**. How would he measure **1.5 kg** of meat on the balance at once?
2. The figure below shows an empty beaker placed on the top of a pan calibrated in grammes. **50ml** of alcohol of density **0.8g/cm3** was added to the beaker. Show on the diagram the new pointer position. (3mk)

**Empty beaker**

**20**

**0**

**10**

**70**

**30**

**40**

**60**

**50**

 **100**

**90**

**80**

1. Figure below shows the arrangement of a sensitive spring balance.

**Curled hair**

**Pan**

**Sliding load**

**Pivot**

**Scale**

**0**

**2**

**4**

**6**

**kg**

How would you adjust the position of the sliding load to reset its reading to zero? (1 mk)