Ordinary Level

Physics Material

Form Two Review

Numerical Questions

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ABOUT THE PAMPHLET

This pamphlet consists of all the Numerical question topics of Form One and Form Two. As there are many questions from different resources, students are able to master these topics involving calculations very easily; by attempting all question and finding the solutions on the questions which seem to be difficult to them. This prepares students with good environment to sit on a Form Two Physics National Examination.

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DENSITY AND RELATIVE DENSITY

1. Find the mass of 100cm^3 of wood with the density of 0.9g/cm^3

2. The density of mercury is 13.6g/cm^3. find the volume of 408g of mercury

3. A rectangular metal block measuring 16cm × 10cm × 4cm has a mass of 1760g. What will be the mass of the same metal measuring 12cm × 8cm × 2cm?

4. If the mass of oil is 24g, and its volume is 60cm^3, then its density is……

5. A piece of metal of volume 0.24cm^3 and mass of 0.72g has a relative density of……..

6. A relative density bottle has a mass of 18.5g when empty, 54.5g when filled with water and 38.3g when filled with second liquid. Find the density of the second liquid.

7. An empty bottle weighs 20g. When full of water it weighs 70g and when full of liquid it weighs 60g. calculate:-
   a) The relative liquid of the liquid
   b) Its density

8. A piece of metal of volume 10cm^3 has a mass of 65.5kg. Find the density of metal.

9. The mass of an empty density bottle was 50g. When filled with a certain liquid of volume 20cm^3 its mass became 75g. Find the:-
   a) Density of the liquid
   b) Relative density of the liquid

10. Calculate the volume of the piece of metal with a mass of 150g and density of 0.03g/cm^3

11. A piece of metal with a volume of 0.00012m^3 has a mass of 0.12kg. Compute the density of the metal in grams per cubic centimeter.

12. The initial volume in a burette was read as 23cm^3. X cm^3 of the liquid was run out and the final volume was read as 53cm^3. If the mass of the liquid was 60g. Calculate:-
    a) The value of X
    b) The density of the liquid

13. What is the volume of the irregular solid immersed in 50cm^3 of water contained in a beaker if it raises the water level to 57cm^3

14. An irregular solid X has a mass of 50g. When it is totally immersed in water of volume 60cm^3, the final volume is read as 70cm^3. calculate the density of the irregular solid X.

15. An object has a density of 7g/cm^3 Calculate its relative density, RD

16. A piece of metal of volume 5.1cm^3 has a mass of 41.6g. Calculate the relative density of copper.
17. A small quantity of powdered charcoal is placed into a 100cm density bottle and the total mass is measured to be 255g. When the bottle is filled with water, the total mass is 289g. What is the density of the powdered charcoal?

18. Density of wood is 0.6 g/cm^3. What is the mass of wooden block which has volume of 2000 cm^3?
    a) If a hole of 500 cm^3 is made in the wood what is its new mass.
    b) If the hole is filled with the lead of density 11 g/cm^3. What is mass of the block?

19. A solid with irregular shape has mass of 178g. The body is immersed in water of 60cm^3 contained in a measuring cylinder. If the final volume of water is 80 cm^3. Calculate the density and relative density of the solid.

20. Density of wood is 0.6 g/cm^3. What is the mass of wooden block which has volume of 2000 cm^3?
    a) If a hole of 500 cm^3 is made in the wood what is its new mass.
    b) If the hole is filled with the lead of density 11 g/cm^3. What is mass of the block?

21. A rectangular wooden block has a density of 600 kg/m^3 and dimensions of 20 cm, 40 cm and 50 cm.
    a. Calculate the mass of block?
    b. Calculate the weight of block?
    c. Calculate mass of the block on the moon (g_{moon} = 10\6 N\kg)

22. A glass has a mass of 30 g when it is empty. When it is filled with mercury the total mass becomes 302 g. What is the total mass in grams when the glass is filled with water? ($d_{mercury}$=13.6 g/cm^3, d_{water}=1 g/cm^3)

23. The relative density of a body of density 540 kg/m^3
    ……
    ……

24. If a 200 g of solid lead ball of density 11.3 g/cm^3 is placed in a Eureka can filled with water, what volume of water will overflow?

25. A block has weight of 200,000N and dimensions 1m × 2m × 5m. Its density is

26. A relative density bottle has mass of 14.0g when empty. Its mass is 58g when full of turpentine and 64g when full of water. Calculate density of turpentine.

27. A solid with irregular shape has mass of 178g. The body is immersed in water of 60cm^3 contained in a measuring cylinder. If the final volume of water is 80 cm^3. Calculate the density and relative density of the solid

28. AN empty density bottle weighs 20g, when full of water it weighs 70g, when full of liquid it weighs 60g. Calculate:-
    a. The relative density of a liquid
    b. Its density

29. If mass of an object is 0.72g and its volume is 0.24 cm^3. What is its relative density?

30. A measuring cylinder of base area 5cm^2 is filled with water up to height of 5cm, when a stone unknown volume is immersed in the water. Height of water in the cylinder increases to 7.5cm.
    a. Calculate the volume of water in the cylinder.
    b. Calculate the volume of stone.

31. A rectangular metal block measuring 8cm × 5cm × 2cm has a mass of 880g. What will be the mass of a block of the same metal measuring 6cm × 4cm × 1cm?

32. A relative density bottle has a mass of 29.2g when dry and empty. Its mass is 116.2g when full of turpentine and 129.2g when full of water. Find R. D of turpentine.

33. A solid with irregular shape has mass of 230g. The body is immersed in water of $60cm^3$ contained in a measuring cylinder. If the final volume of water is $80cm^3$, calculate the density and relative density of the body.

34. A relative density bottle has mass of 14.0g when empty. Its mass is 58g when full of turpentine and 64g when full of water. Calculate the density of turpentine. A solid with irregular shape has mass of 178g. The body is immersed in water of $60cm^3$ contained in a measuring cylinder. If the final volume of water is 80 cm^3, calculate the
    (i) density
    (ii) Relative density of the solid.

35. A solid with irregular shape has mass of 178g. The body is immersed in water of $60cm^3$ contained in a measuring cylinder. If the final volume of water is 80 cm^3, calculate the
    (i) Density
    (ii) Relative density of the solid.

36. A measuring cylinder base area of 40 cm^2 is filled with a water up to height of 5 cm. when a piece of stone immersed in water, level of water increases up to height of 6 cm.
    i. Calculate the volume of water in the cylinder before solid is immersed.
    ii. Calculate the volume of irregular solid.

37. An ordinary hydrometer of mass 27g floats with 4cm of its stem out of water. If the cross sectional area of the stem is 0.75cm; calculate:-
    a. The total volume of the stem under the surface of the liquid.
    b. The relative density of the liquid.

38. The mass of the density bottle is 15g. When it is filled full with a fluid of density $1.2g/cm^3$, its mass is 51g. Find the volume of the bottle.

39. A liquid L has a mass of 15g and a liquid M has a volume $3cm^3$. If their two densities are $3g/cm^3$ and $4g/cm^3$ respectively. Determine the density of the homogenous mixture formed by mixing two liquids.

40. A crown made of an alloy of gold and silver has a volume of $60cm^3$ and a mass of 1050g. Find the mass of gold contained in the crown. (The density of gold is $19.3g/cm^3$, while that of silver is $10.5g/cm^3$)

FORCE AND ARCHIMEDES PRINCIPLE & LAW OF FLOTATION

1. A body weighs 10 N in air and 8 N when immersed in water. Density of the body is:

2. An object weighs 500N in air and 340N when immersed in alcohol. Find the upthrust on the object.

3. When a wooden block floats in water, it displaces 0.006 m^3 of water. Find the weight of the wooden block when it is in air.

4. A body weighs 0.8 N in air and 0.5 N when completely immersed in water. Calculate:
   (a) The relative density.
   (b) The density of the body.

5. A solid body weighs 30 N in air but when it is completely immersed in water the body weighs 12 N. Calculate the apparent loss in weight of the body and the volume of water displaced.

6. A body weighs 4.6 N in air and 3.1 N when immersed in water. Find the upthrust exerted on the body by the water.

7. A body has a mass of 10kg. Find the weight of the body.

8. A piece of stone weighs 0.55N in air,0.49 in water and 0.51 in the certain liquid
   - Find the density of stone
   - Find the relative density of the liquid

9. If a weight of chicken on earth is 20N. What would be the weight of chicken on a moon?

10. A solid weighs 64N in air and 48N when totally immersed in a liquid of 0.8 g/cm^3. Calculate:
    (i) The upthrust on the solid
    (ii) The volume of the solid
    (iii) The density of the solid

11. A block of 40 cm^3 is floating on oil of density 0.9 g/cm^3. If 20 cm^3 of it is immersed in the liquid, find the density of the block

12. When a body is totally immersed in a liquid it weighs 3.2 N. If weight of object in air is 4.7 N calculate:
    (i) Apparent weight
    (ii) Apparent loss in weight
    (iii) Upthrust
    (iv) Weight of liquid displaced

13. A mass of 60 kg weighs 600 N on the Earth and 100 N on the Moon. What is the mass and weight of an object on the Earth if it weighs 50 N on the Moon?

14. A lump of brass weighs 0.45N in air, 0.39N in water and 0.41N in certain oil.
    (i) Find the density of brass.
    (ii) Find the relative density of oil.

15. If an object weighs 500N on the earth, will it weigh less, more or same on the moon? Why?

16. When a body of weight 6.4N immersed in water it weighs 4.8 N. Therefore the upthrust acting on the body is……

17. When an object is totally immersed in water, its weight is recorded as 3.1N. if its weight in air is 4.9N, calculate the upthrust acting on this object.

18. A body immersed in water displaced 1.1N of the liquid. If its weight while in the water is 3.3 N, find its weight in air.

19. An aluminium cube has a volume of 800cm. if it is totally immersed in water, calculate the upthrust acting on it.

20. An iron piece of mass 360g and a density of 6 g/cm^3 is suspended by a rope so that it is partially submerged (halfway) in oil of density 0.9g/cm. Find the tension (force) in the string.

21. A body lost 0.6N in weight when immersed in water. Calculate its volume in cubic centimetres.
22. A boat has a mass of 1000000kg and it is floating on sea water. Calculate the amount of water displaced.

23. What volume of iron of density 0.8g/cm^3 must be attached to wood whose mass is 100g if wood has a density of 0.3g/cm^3 and both have to be submerged in water.

24. An object is hung from a spring balance. It weighs 40N in air and 30N when immersed in water.
    a. Calculate the upthrust on the object
    b. Determine the weight of the water displaced
    c. What is the mass of the displaced water
    d. What is the volume of the displaced water
    e. Calculate the volume and mass of the object
    f. Calculate the relative density of the object
    g. Calculate its density

25. An object weighs 60N when in air and 40N when immersed in water. What is its:
    a. Relative density
    b. Density

26. When an object with a mass of 250g is submerged in water, its weight is measured to be 2.2N
    a. What is the upthrust acting on the object?
    b. What is the density of the object?

27. A 300g object weighs 2.5N in air and 2N in unknown liquid. What is the density of the liquid?

28. When an object of mass 200g is submerged in methanol, its apparent weight is 1.052N. When submerged in benzene, its apparent weight is 0.951N. If the density of methanol is 0.8g/cm^3, what is the density of benzene?

29. An object with a volume of 150cm is found floating in water with 60% of its volume submerged. What is the density of the object?

30. An object floats in water with 40% of its volume submerged.
    a. If the object was placed in methanol with a density of 0.79g/cm^3, what percentage would be submerged?
    b. If it was placed in liquid carbon tetrachloride with a density of 1.58g/cm, what percentage would be submerged?

31. The weight of the body is 20N in air, 15N when totally immersed in water and 18N when totally immersed in liquid L. What is the relative density of liquid L?

32. A solid body weighs 30N in air but when it is completely immersed in water the body weighs 12N. Calculate the apparent loss in weight of the body and the volume of water displaced.

33. When a wooden block floats in water, it displaces 0.006m of the water. Find the weight of the wooden block when it is in air.

34. A body weighs 1.2N in air, 0.75N when completely immersed in water and 0.90N when completely immersed in another liquid. Calculate the density of another liquid.

35. When a body is totally immersed in liquid, its weight is 3.6N. If the weight of the liquid displaced is 18N, find the real weight of the body.

36. A body weighs 0.8N in air and 0.5N when completely immersed in water. Calculate:

a. The density of the body
b. The relative density of the body

37. A solid weighs 60N in air and 40N when totally immersed in liquid of density $0.7g/cm^3$. Calculate:-

a) The weight of the liquid displaced
b) The volume of the solid
c) The density of the solid

38. A block of metal of density $2700kg/m^3$ has a volume of $4.0 \times 10^{-7}m^3$. Calculate:-

a) Mass of the block
b) Apparent weight when immersed in brine of density $1200kg/m^3$.

39. A boat of volume 12m, floating on water has a mass of 1000kg;

a) What is the upthrust acting on it?
b) What is the weight of the displaced water?
c) What percentage of the boat is above water?

40. a piece of metal weighs 0.54N in air and 0.24N when immersed in water. Find:-

a) Its density
b) Its apparent weight in a liquid of density $1.2g/cm^3$

41. A ship of mass 1200tonnes floats in sea water. What volume of the sea water does it displace?

42. A floating crane has a mass of 20,600kg and floats in seam water of density 1030kg/m. If the base of the crane is a rectangular block 4m square and 2.5 deep. What is the maximum mass which can be lifted by the crane when the top of the base is just awash with water?

43. A piece of cork with volume 100cm is floating on water. If the density of the cork is $0.25g/cm^3$:

a) Calculate the volume of the cork immersed in water
b) What force is needed to immerse the cork completely?

44. Ice has a density about $0.9g/cm^3$. What fraction of the volume of an ice berg is submerged in water?

45. An iron cube of mass 480g and density $8g/cm^3$ is suspended by a string so that it is half immersed in oil of density $0.9g/cm^3$. Find the tension in the string.

PRESSURE

1. A body with a force of 1000000N has an area of $50m^2$. Calculate the pressure exerted by the body.

2. A rectangular block of weight 15N rests on a horizontal table. If it measures 40cm by 30cm by 20cm, calculate the greatest and least pressure that the block can exert on the table.

3. Calculate the pressure under feet of Fatima if the area of contact of her foot is $80cm^2$ and her mass is 43.8kg.

4. The mass of a cuboid is 60kg. If it measures 50cm by 30cm by 20cm, what is the maximum pressure that it can exert?

5. A rectangular metal block with sides 1.5m by 1.2m by 1.0m rests on a horizontal surface. If the density of metal is $7000kg/m^3$, calculate the maximum and minimum pressure that the body can exert on the surface.

6. A cube of sides 2cm is completely immersed in water so that the bottom of the cube is at a depth of 10cm.

7. Calculate the pressure exerted on a diver at a depth of 20m below the surface of water in a sea.

8. A rectangular tank measures 5m by 3m by 3m at its base. It contains water to a height of 3m. Calculate the pressure on the base of the tank.

9. A small submarine has an area of 1000m. What force would be exerted on the submarine by the water if it was submerged to a depth of 50m?

10. Calculate the pressure at the bottom of the tank of water 15m deep due to the water above it.

11. Given that there is a considerable decrease in atmospheric pressure of 1.2×10^3 Pa for every 100m increase in height (altitude), determine the density of air.

12. The pistons of hydraulic press have their areas given as $3.0 \times 10^{-4}m^2$ and $2.0 \times 10^{-2}m^2$ respectively. If the smaller piston is pushed down with a force of 120 N, what is the force required to push the larger piston?

13. A hydraulic lift has pistons with areas of $0.02m^2$ and $0.1m^2$. A car with a weight of 5000N sits on a platform mounted on a larger piston.
    a. How much force must be applied to a piston 1 to lift the car?
    b. How far must piston 1 be pushed downward to raise the car 0.3m?

14. A hydraulic brake has a force of 500N applied to a piston whose area is $5cm^2$.
    a. What is the pressure transmitted throughout the liquid?
    b. If the other piston has an area of 20cm, what is the force exerted on it?

15. The smaller piston of a hydraulic press has area of $20cm^2$ and pushed down ward with a force of 100N.If the area of longer piston $500cm^3$, find the weight which can be supported

16. Water is filled of 100m behind a dam; find the pressure exerted at the bottom of the dam due to water

17. In a hydraulic brake, a force of 400 N is applied to a piston of area 5 cm^2.

i) What is the pressure transmitted throughout the liquid?

ii) If the other piston has an area of 48 cm^2, what is the force exerted on it?

18. A patient is to get an injection. If the point of the needle has a cross – sectional area of 0.000001m^2 and the nurse exerts a force of 0.5N. What pressure does the needle tip produce on the skin of the patient?

19. A rectangular tank which measures 3m by 2m contains water to a height of 2m. Calculate the pressure and the thrust on the base of the tank.

20. A force of 5N is applied to the smaller piston of a hydraulic press. If the smaller piston has a cross-sectional area of 0.001m^2 and the large piston has a cross-sectional area of 0.1m^2; find the force produced on the large piston.

21. What will be the pressure due to a column of water of height 3m if the density of water is 1000kg/m^3?

22. A submarine is at a distance of 35m below the surface of sea water of a density 1030kg/m^3. Find the pressure exerted on it by the water.

23. A can holds water with a constant depth of 0.5m. The surface of water is exposed to the atmosphere. What is the pressure on the bottom of the can?

24. A submarine has a surface area of approximately 82000m^2. If it is travelling at a depth of 300m in the ocean, what is the total force on the submarine's outer hull? (*Use the density of water as 1025kg/m^3*)

25. In a hydraulic brake system, the piston in the master cylinder has a diameter of 2.0cm and the piston in the slave cylinder have the diameter of 3.5cm. The brake pedal is pushed down 10cm with a force of 50N. How far do the brake shoes move and with what force do they press against the brake drum?

26. A can holds water with a constant depth of 0.5m. Hole A is punched in the can 0.1m below the surface and the hole B is punched 0.4m from the surface. From which hole will the water spurt the farthest? Explain your answer.

27. A rectangular box whose dimensions are 1.2m by 0.5 m by 3 m has a density of 25000 kg/m^3. Calculate the maximum pressure it can exert to the ground.

28.(a) A rectangular box rests on a flat horizontal surface and has a weight of 100N. Calculate the pressure on the surface if the base of the box has square shape with an edge of 2m?

(b) A weight W placed on top of the box. If the pressure at the base increased to 60N/m^2, find W.

29. Piston of small cross section area of 30.0 cm^2 is used ın hydraulic press to exert a force of 300.0N on the enclosed liquid. A commenting pipe leads to a large piston of cross sectional area 600.0cm^2. Find

i. The force formed on the large piston

ii. The force applied on the smaller piston to support 2000N of the large piston.

30. A metal block has dimension 5 x 6 x 8 cm. If the mass of the block ıs 30g, find its maximum and minimum pressure it can exert.

31. Smaller piston of a hydraulic press has an area of 30 cm^2 and pushed downward with a force of 100 N. If the area of the larger piston is 750 cm^2, find the weight which can be supported.

32. A rectangular solid block has sides 4cm, 10cm, 20cm and density 8000kg/m^3. If it rests on horizontal flat surface, calculate the maximum and minimum pressure it can exert in *Pa.*

33. Briefly explain why:
   a) The tyres of a tractor are large and wide
   b) The woman wearing shoes with pointed heels is more likely to cause damage to a wooden floor than an elephant

34. Explain why hitting an inflated balloon with a hammer will not cause it to burst but sticking it with a pin will.

35. Why are dams constructed thicker at the bottom than the top?

36. Wind in the atmosphere blow from regions of high pressure towards regions of low atmospheric pressure. Would you expect winds to blow from warm regions to the cooler ones or from cooler to warmer areas? Explain your answer.

37. A hole at the bottom of the ship is more dangerous than one near the surface. Explain this.

38. Explain why the buildings are constructed with wide foundations.

39. If you sat on the tip of a nail you would experience a lot of pain whereas you could lie on a bed of nails and feel no pain. Is this true? Explain.

WORK, ENERGY AND POWER

1. How much work is done to first lift a 7kg object a distance of 2m and then hold it at that height for 10s?

2. A force of 80N pulls a box along a smooth and level ground through a distance of 5m. Calculate the work done by the force.

3. If a man pushes a van against a force of 300N for a distance of 10m, how much work does he do?

4. A man lifts a load of 20kg through a height of 3m. Calculate the work done.

5. An object has a mass of 5kg. What is the kinetic energy if its speed is:
   a) 5m/s
   b) 10m/s

6. What is the kinetic energy of a 12g bullet travelling at 320m/s?

7. A stone of 2kg mass falls from a height of 25m above the ground. Calculate the potential energy possessed by the stone.

8. A 2kg object is at rest on a table 1.2m above the floor. The ceiling in the room is 2.8m above the floor. What is the gravitational potential energy of the object?

9. Determine the potential energy possessed by a particle of mass 0.2kg resting on a table 1.6m above the floor.

10. Amina has a mass of 80kg. If she runs at a speed of 10m/s, calculate her kinetic energy.

11. A stone of mass 10kg is thrown down to the ground 10m down. If it hits the ground with a velocity of 20m/s, determine its:

a) Kinetic energy

b) Potential energy
   a)

12. How much power is required to accelerate a 1000kg car from rest to 26.7m/s in 8s?

13. Calculate the work done given that a 10kg object is lifted to a height of 5m above the ground.

14. A motor exerts a horizontal force of 200N in pulling a box 10m across a level floor. How much work did the motor do?

15. A 1000kg car is travelling down the road at a speed of 15m/s. How much kinetic energy does it have?

16. Rock A has a mass of 2kg and a speed of 1m/s. Another rock B has a mass of 1kg and a speed of 2m/s. Which rock has more kinetic energy?

17. If your mass is 45kg, how much work would you do in climbing a ladder that is 5m high?

18. A 2kg object is on a table top 1.1m above the floor. How much work would be required to lift it at a constant velocity to a shelf 1.3m above the floor?

19. A 3kg box starts down a hill 3.3m deep with an initial velocity of 5m/s. If on reaching the bottom of the hill its velocity is 7.5m/s, how much work was done by the box to overcome friction?

20. A car of mass 1200kg starts from rest at the bottom of a hill 4m high and reaches the top with a velocity of 15m/s. If it took the car 12s to reach the top, what was the power output of its engine? Express your answer in both watts and horse power.

21. A stone of mass 0.5kg is thrown with an initial velocity of 10m/s. What will be its initial kinetic energy?

22. A man raised a sack of rice of mass 60kg from the ground to a height of 2m in 5seconds. Find the power developed by the man.

23. Find the potential energy gained by 800kg of concrete block when raised up through a height of 40m.

24. A man weighing 800N takes a minute to run upstairs. In so doing he ascends a vertical height of 3m. Find his power in hp.

25. A 50kg girl runs up a staircase of 50 steps, each of height 15cm, in 10 seconds.
a) Find the work done against the gravity
b) At what power is she running?

25. Find the power required to pump 15kg of water in one second through a height of 30m.

26. The work done against the pull of gravity of a stone of mass 10kg raised to a height of 1m above the ground is……..

27. A man of mass 90 kg run up a flight of stairs 10 m high in 4 seconds. Calculate the work done and the power generated by the man.

28. A ball of mass 0.2kg is dropped from a height of 20m. On impact with the ground, it loses 30J of energy. Calculate the height it reaches on the rebound.

29. A pendulum swings 8cm above the ground at the highest point and is practically touching the ground at the lowest point. What is the maximum velocity of the pendulum?

30. If the mass of 4.5kg falls freely from rest from 20m height, just before it strikes the ground; calculate the maximum kinetic energy it will gain.

31. An athlete using spring exerts an average force of 400N to enable her to extend the spring by 0.21m;
a) Calculate the work done by this athlete in extending the spring once.
b) If she is able to extend the spring by this amount and release it 24 times in 60s, calculate the power used by this athlete while doing this exercise.

32. A pendulum bob of mass 50g is pulled aside to a vertical height of 20m from the horizontal and then released. Find:-
a) The maximum potential energy of the bob
b) The maximum speed of the bob

33. An apple of mass 0.3kg falls to the ground from a height of 21.9metres. If the acceleration due to gravity is $10m/s^2$,
a) Mention all energy changes that take place in the process
b) Find the energy it possesses before falling
c) Find the energy possessed by the apple when just reaches the ground
d) Comment on your answers in *b* and *c* above.

34. A rubber ball of mass 0.12kg is held at a height of 2.5m above the ground, and then released.

a) Calculate the kinetic energy of the ball just before it hits the ground.
b) Calculate the velocity of the ball just before it hits the ground.
c) Give one reason why the ball rebounds to a height of less that 2.5m above the ground.

ELECTRICITY

1. A capacitor of capacitance 50μF is allowed to charge. The pd between its plates is 10V. How much charge will accumulate on the plates during the time of charging?

2. If a cell has a voltage of 1.5V, calculate the capacitance of the capacitor when the charge is 90 coulombs.

3. Three capacitors; 10μC, 20μC and 30μC are arranged in series. Calculate the single capacitor that would replace them.

4. Three capacitors of values 2μF, 3μF and 6μF are connected in series and then parallel. What is the equivalent capacitance in each case?

5. A capacitor of two parallel plates separated by air has a capacitance of 15pF. How much more charge can be put on the capacitor using the 18V supply.

6. Find the resistance of an operating lamp rated 115V and a current of 0.25A.

7. A current of 100mA flows through a 5kΩ resistor. What is the pd across the resistor?

8. Three resistors 2Ω, 3Ω and 6Ω are connected in series to a 3V battery. What is the current in the circuit?

9. Given two resistors, 6Ω and 12Ω. Explain how you can connect them in the circuit.

10. Two resistors 3Ω and 6Ω are connected in parallel.

(a) Draw the schematic diagram

(b) What is the total resistance of the circuit?

(c) Calculate the pd of the circuit when the current across that is 5A.

11. An electric circuit has 2 two resistors of 4 ohms and 8 ohms, and a cell of 12 volts. Calculate current passing through 4 ohms resistor if:

(i) Resistors connected in parallel.
(ii) Resistors connected in series.

12. The resistance of a lamp operating on a 120 Volt line when it draws a current of 0.5 Ampere is

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13. An electric circuit has 2 two resistors of 4 ohms and 8 ohms, and a cell of 12 volts. Calculate current passing through 4 ohms resistor if:

(i) Resistors connected in parallel.
(ii) Resistors connected in series.

14. A voltmeter connected across on electric appliance reads 3V and ammeter in series with it reads 0.75A.

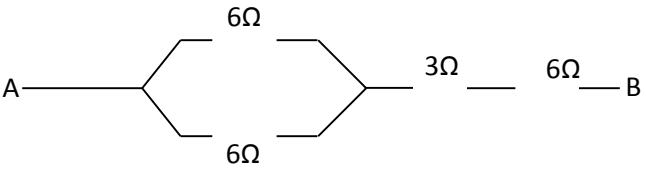
(i) Draw the circuit diagram to represent above information.
(ii) Calculate the resistance of the appliance.

15. An electric circuit has 2 two resistors of 4 ohms and 8 ohms, and a cell of 12 volts. Calculate current passing through 4 ohms resistor if:

(i) Resistors connected in parallel.
(ii) Resistors connected in series.

16. A potential difference of 12V is applied across a resistor of resistance 240 ohms. Find the current in the circuit.

17. What is the sum of the resistance between points A and B in the diagram shown below.



18. A voltmeter connected across the electric bulb reads 3V and an ammeter in series with a battery of 2 cells reads 0.2A. If the switch is closed:

(i) Draw a circuit diagram to represent the information.
(ii) Calculate the resistance of the electric bulb.

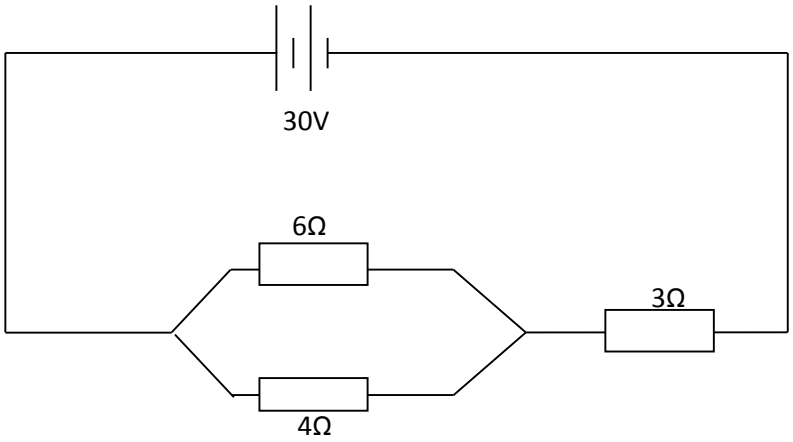
19. Three resistors of 2Ω, 3 Ω and 6 Ω are connected in series to a 3 V battery

i. Draw the clear diagram
ii. Find the equivalent resistance
iii. Calculate the current in the circuit

20. A potential difference of 12V is applied across a resistor of resistance 240 ohms. Find the current in the circuit.

21. From the circuit diagram below calculate

(i) the pd across 4Ω resistor
(ii) What is the current flowing through the 3Ω resistor?



22. Show that for two resistors R_1 and R_2 connected in parallel, their equivalent resistance

$$R_T = \frac{R_1 R_2}{R_1 + R_2}$$

23. Find the equivalent resistance if the two resistors of values 5 are connected in:-

- Parallel
- Series

23. If a pd of 6V is measured across the ends of a wire of resistance 12Ω,

(a) What current flows through it
(b) What pd is required to make a current of 1.5A flows through it?

24. You have been provided with the resistors 5Ω, 10Ω and 20Ω. What are the maximum and minimum resistances obtained by connecting those resistances?

25. Two resistors of resistances 3Ω and 5Ω are connected in parallel and this combination is connected in series to the 3Ω resistor.

a) draw the schematic diagram
b) calculate the total resistance of the combination

26. Two resistors of 2Ω and3Ω are connected in series with 10V battery of negligible internal resistance. Calculate the pd across the 3Ω resistor.

27. Two resistors of 3Ω and X are connected in parallel. If the total resistance is 1.2Ω, calculate:-

a) The value of X
b) The current passing through X, if the combination was passing through the pd of 12V in the circuit.

28. Three conductors of resistances 10Ω, 15Ω and 25Ω are joined in series across a 100V supply. Find:-

a) The total resistance
b) The current in the circuit
c) The pd across each resistor

29. A 15Ω resistor is connected between points B and C while a 5Ω resistor is connected between points C and D. If an accumulator of emf 2.0V is connected between points B and D, find the voltage across the 5Ω resistor.

30. An accumulator of emf 2V and negligible internal resistance is connected in series with a resistor of resistance 50Ω and an ammeter of resistance 5Ω. A voltmeter of resistance 450Ω is connected in parallel with 50Ω resistor. Calculate:-

a) The ammeter reading
b) Voltmeter reading

31. A capacitor is labelled with the capacitance value of 470F and is charged to a potential difference of 10V. Calculate the charge stored by the capacitor.

32. Two capacitors with capacitance of 5μF and 10μF are connected in parallel, and a potential difference of 20V is applied across the terminals of this combination. Calculate:

(i) The equivalent capacitance of the capacitors.
(ii) The total charge that can be store by these two capacitors.

33. A capacitor of capacitance 250μF is allowed to charge until the potential difference between its plates in 10V. How much charge accumulates on the plates during the charging process?

34. Three resistors of 4Ω, 5Ω and 6 Ω are connected in series to a 3 V battery

i. Draw the clear diagram
ii. Find the equivalent resistance
iii. Calculate the current in the circuit
iv. Calculate the voltage across each resistor

35. Three resistors, each has a resistance of 9 ohm, are connected in series to a rheostat, ammeter, battery and a switch. Rheostat is arranged so that it has a resistance of 7 ohm. Initially switch is open. After closing switch ammeter reads 22 A.

a) Draw a neat diagram of circuit.
b) Calculate the equivalent resistance of three resistors firstly than equivalent resistance of circuit secondly.
c) Find the potential of battery.

36. A potential difference of 12V is applied across a resistor of resistance 240 ohms. Find the current in the circuit.

37. Calculate the current in the circuit flowing given that the amount of charge flowing in 5minutes is 60μC.

FORCES IN EQUILIBRIUM

1. A uniform rod 1m long of mass 50g is supported horizontally on two knife edges placed 10cm from its ends. What will be the reaction at these supports when a 100g mass is suspended 10cm from the midpoint of the rod?

2. A 0.2N weight placed on a 10cm mark of the metre rule just balances an object hanging from the 60cm mark. Calculate the weight of the object.

3. A uniform wooden bar AB 120cm long and weighing 1.2N rests on two sharp edged supports C and D placed 10cm mark from each end of the bar respectively. A 0.2N weight hangs from a loop of thread 30cm from A and a 0.9N weight hangs similarly 40cm from B. Find the reactions at the supports.

4. A line of action of a force of 48N is at a perpendicular distance of 1.5m from a point. Find the moment of a force about a point.

5. The moment of about a point is 1020Nm. If the magnitude of the force is 5600N, find the perpendicular distance between the point and the line of action of the force.

6. A uniform half metre rule AB is balanced horizontally on a knife edge placed 5cm from B with a mass of 80g at B. Find the mass of the rule.

7. A uniform bar AB of length 5m weighs 60N. The bar is supported in a horizontal position by two vertical strings X and Y. If string X is 0.6m from A and string Y is 1.8m from B, find the tension in the strings.

8. A heavy metal beam AB of mass 25kg is supported at its ends. The beam carries a mass of 150kg at a distance of 0.75m from end A. If the beam is 2m long, determine the thrust at supports A and B.

9. A metre rule is pivoted at its midpoint. If two objects of weights 1.0N and 2.0N are suspended at 30cm and 90cm respectively from one end, calculate the position where an upward force of 3.0N must be applied in order for the metre rule to balance horizontally.

10. A uniform rod AB of mass 6.0g is balanced horizontally about a knife edge at a distance of 3cm from end A where a mass of 8.0g is hanging. Find the length of the rod.

11. A uniform rod with a mass of 120g and length of 130cm is suspended by a wire from a point 80cm from the rod's left end. What mass must be hang from the right end of the rod for it to be in equilibrium? What will be the tension in the wire?

12. Mr. Wans has a mass of 60kg and he is sitting on a see-saw at a distance of 2.5m from the pivot. Calculate the moment due to his weight.

13. A uniform wooden plank with a mass of 5m is placed on top of a brick wall so that 1.5m of the plank extends beyond the wall's edge. How far beyond the edge of the wall can a 100kg woman walk before the plank began to rotate? (*Let the plank's axis of rotation be at the wall's edge*)

14. A uniform half metre rule is freely pivoted at the 15cm mark and it balances

horizontally when a body of mass 40g is hung from the 2cm mark.

a) Draw a clear force-diagram of the arrangement.
b) Calculate the mass of the rule.

15. A pole AB of length 10m and weight 800N has its centre of gravity 4m from the end A and lies on a horizontal ground. The end B is to be lifted by a vertical force applied at B. Calculate the least force that is required to do this.

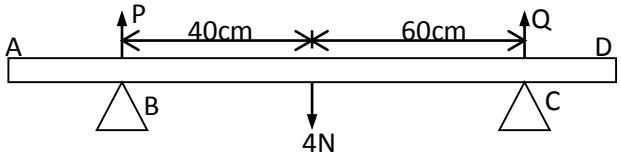
16. A uniform ruler of 100 cm length and weight of 150 N is suspended to a ceiling with two wires. First wire is tied from the mark of 20 cm and second one is binded from the mark of 95 cm. System in equilibrium.

a) Draw a figure of system.
b) i) Write the principle of moments?
ii) Calculate the force applied by first wire?
c) i) What is total force on system?
ii) Calculate the force on the second wire?

17. A body is in equilibrium when the mass of 1.30N and 140N are hanging at the ends of the body. Also the body should be suggest by two vertical string X and Y which divide the body into 3 equal parts each of length 4cm. Calculate the tension in each string.

18. A uniform metre rule of mass 50g was resting on two knife edges placed at 10 cm mark and 90 cm mark respectively. A load of 100g was placed at 60 cm mark. Calculate the reactions at the knife edges.

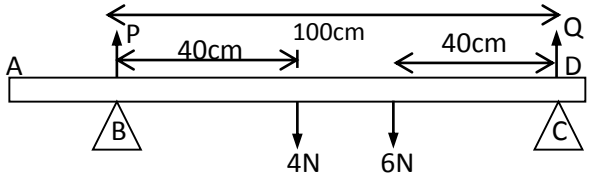
19. A light beam AD rests on supports at B and C as shown in the figure below. A load of 4N is placed at O where BO is 40cm and CO is 60cm. Find the reactions P and Q at the supports



20. A uniform 50cm ruler is freely pivoted at the 15cm mark and it balances horizontally when a body of mass 40gm is hung from the 2cm mark

i) Draw a clear diagram of the arrangement
ii) Calculate mass of ruler

21. A light beam AD rests on supports at B and C as shown in the figure below. A load of 4N is placed at O where BO is 40cm and CO is 60cm. Find the reactions P and Q at the supports



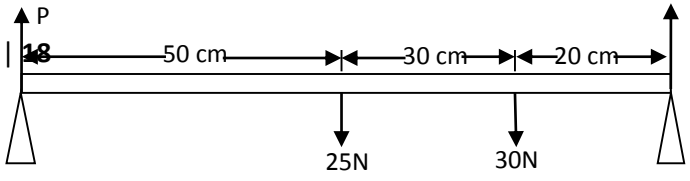
22. A uniform half metre rule is pivoted at the 15cm mark and it balances horizontally when a body of mass 40g is hung from the 2cm mark.

(i) Draw a clear force-diagram of the arrangement
(ii) Calculate the mass of the rule.

23. The moment of force about a point is 400Nm of the magnitude of the force is 25N, find the perpendicular distance between the time of action and the force.

24. Given the figure below, calculate the forces P and Q

25. A uniform bar AB of length 5m weighs 60N. The bar is supported horizontally by two vertical strings x and y. If x is 0.6m



from A and strings y is 1.8m from B, find the tensions in these strings.

26. A uniform beam AB of length 5m weighs 60N. The bar is supported in a horizontal position by two vertical strings X and Y. If string X is 0.6m from A and the string Y is 1.8m from B, if 100N is attached 1m from A. Find the tensions in the string.

27. A 150g rod balances at its centre of gravity. A 20g mass is placed 120cm from the pivot point.

a) How far from the pivot must the 50g mass be placed for the system to be in equilibrium?
b) What upward force does the pivot exert on the rod?

28. A metre rule is pivoted at 40cm mark and is balanced when a load of 0.2N is placed at 10cm mark. Calculate the mass of the metre rule.

29. A heavy uniform beam AB of weight 500N is supported at its ends. The beam carries a weight of 300N at a distance of 1.5m from the end A. If the beam is 4m long. Find the reaction/thrust/tension at A and B.

30. A uniform half metre rule is pivoted at its 30cm mark. A mass of 50g hung at the 45cm mark keeps the rule horizontal. Determine the mass of the half metre rule.

31. A uniform metal bar of length 5m and mass 9kg is suspended horizontally by two vertical wires attached at 50cm and 150cm respectively from the ends of the bar. Find the tension in each bar.

SIMPLE MACHINES

1. A wheel and axle of efficency 75% is used to raise a load 1500 N. if the radius of the wheel is 40 cm and that of the axle is 4cm, then the effort required to cover the load is:

2. Smaller piston of a hydraulic press has an area of 30 cm² and pushed downward with a force of 100 N. If the area of the larger piston is 750 cm², and its efficiency is 50% find;

i) The weight which can be supported.
ii) The work input of the machine
iii) The work output of the machine

3. An inclined plane is 7m long and its height is 1m. If the efficiency is 70%, find the load which can be moved up the plane by an effort of 150N parallel to the plane.

4. A block and tackle containing 3 fixed and 2 movable pulleys are used to lift a load of 1200N to a store 15m from the ground. If the work done in overcoming friction in the system is 6000J. Calculate the

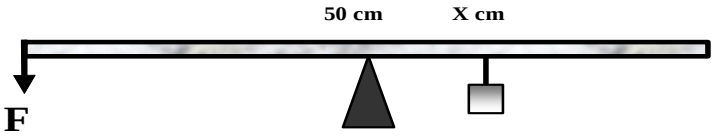
(i) Word done by the effort
(ii) Efficiency of the machine

5. A simple machine was used to raise a load of weight 3920N through a height of 3.5m by applying an effort of 980N. If the distance moved by the effort was found to be 20m, find:

(i) the mechanical advantage
(ii) the velocity ratio and
(iii) The efficiency of the machine.

6. The handle of a screw jack is 35 cm long and the pitch of the screw is 0.5 cm. What force must be applied to lift a load of 2200 N if the efficiency of the jack is 4%.

7. A pulley system consists of 3 fixed and 2 movable pulleys needs effort of 100 N to raise 300 N loads. What is efficiency of the pulley system?



8.

In the figure above a ruler length of 1m is placed on a fulcrum from 50 the mark. A load suspended from x mark. Effort F is 390 N and the load is 78 N.

a) Which type of machine is this machine?
b) From which mark load is suspended, what is x?
c) What is the velocity ratio of the machine?
d) Fulcrum exerts an upward force of 500 N to ruler. Calculate the weight of ruler?

9. A machine with V.R 6 requires 800J of work to raise a load of 600N through a vertical distance of 1m. Find:-

i) Efficiency of the machine.
ii) The mechanical advantage of the machine.

10. In a hydraulic machine the area of large piston is 25 times that of the small piston one. An effort of 20N is applied at the small piston by a rod which travels 20 cm per

stroke. If the area of the large piston is $50cm^2$, calculate

i) The velocity ratio of the machine
ii) The pressure of fluid inside the machine
iii) The trust exerted on the large piston
iv) The work input for 100 stroke of the pump

11. A wheel and axle of efficiency 75% is used to lift a load of 3600N. If the radius of the wheel is 64cm, and that of the axle is 4cm, calculate the velocity ratio, mechanical advantage of the machine and effort required to overcome the load.

12. A man of mass 100kg lifts a box weighing 500kg by standing on one end of the lever. How much mechanical advantage did the lever provide to the man while lifting the box?

13. A machine having a velocity ratio of 5 requires 600J of work to raise a load of 400N. If the load is moved through a distance of 0.5m, calculate the mechanical advantage and efficiency of the machine.

14. An athlete exerts a force of 100N while running a 100m race. If he uses 50 000J of energy, calculate his efficiency.

15. A certain first class lever of length 2.5m has a velocity ratio of 12 and efficiency of 85%.

a) How far from the fulcrum is the effort force applied?
b) What effort is required to lift a load weighing 75N?

16. A pulley system is made up of 8 pulleys. An effort of 200N is applied on the pulley system. If the pulley system has an efficiency of 80%, what is the maximum load that can be raised by the effort applied?

17. Determine the effort required to lift a load of 100N using:

a) A single fixed pulley
b) A single movable pulley
c) Combination pulley system made up of 5 pulleys.
d) Compare your results. Which is the best pulley to use in this case? Why is it the best?

18. A machine has a velocity ratio of 5 and is 80%efficient. What effort would be needed to lift a load of 200N with the aid of this machine?

19. While lifting a load of 200N using a lever, an effort of 80N moved through a distance of 20cm to lift the load through a distance of 4cm. calculate:-

a) Mechanical advantage
b) Velocity ratio, and
c) Efficiency of the machine

20. A block and tackle system consisting of 5 pulleys is used to raise a load of 400N through a height of 10m. If the work done against friction is 100J, calculate:-

a) The work done by the effort
b) The efficiency of the system
c) The effort applied

21. If an effort of 15N is needed to lift a load of 150N with a three pulley system, what is the efficiency of the machine?

22. A force of 600N is used to move a load of 3000N up an inclined plane. Given that the slant height and vertical height of the plane are 18m and 3m respectively, determine:-

a) Velocity ratio of the plane
b) Mechanical advantage of the plane
c) The efficiency of the plane

23. A 200kg crate is to be loaded onto the bed of the truck that is 1.4m above the ground. A metal ramp 5m long is leaned against the truck bed and the crate pushed up along it. Neglecting the frictional force,

a) Calculate the force required to push the crate up the incline at a constant velocity
b) Calculate the MA of the incline.
c) Determine the efficiency of the machine

24. A trolley is pulled up an inclined plane 2m high using a force of 4N. If the mass of the trolley is 1kg:

a) What is MA of the plane?
b) Find its velocity ratio
c) Find its efficiency

25. The effort distance moved by an effort force of 20N to lift a bag is 10cm. If MA of the inclined system is 10, calculate the load distance.

26. A screw jack has 5 threads per centimetre. If the length of the turning lever is 20cm, determine the velocity ratio of the screw jack.

27. A screw jack which has 5 threads per centimetre is used to lift a car weighing 20000N. If the length of the turning lever is 40cm and the efficiency of the screw jack is 90%, find:

a) The velocity ratio of the jack
b) The mechanical advantage of the jack
c) The minimum force required to raise the car.

28. A screw jack has an efficiency of 40% and it is used to lift a load of 400kg. If its pitch is 0.5cm and the effort arm is 0.5m long, find the effort required.

29. The pitch of the screw jack is 0.5m. When used to raise a load, the handle turns through a circle of radius 40cm. What is the MA of the screw jack if its efficiency is 25%?

30. The velocity ratio of the screw jack is 420. If it has 10 threads per centimetre, calculate the length of the turning lever.

31. A screw jack has 8 threads per centimetre of length. If the length of the turning handle is 10cm, calculate the velocity ratio of the screw jack.

32. A wheel and axle with an efficiency of 90% is to be used to raise a load of 10000N. The radius of the wheel is 40cm while that of the axle is 5cm. Calculate:-

a) The velocity ratio of the wheel and axle
b) The mechanical advantage of the wheel and axle
c) The effort required to raise a load of 10000N.

33. A crank handle with a length of 30cm is attached to an axle with a radius of 5cm and is used to lift a bucket of water from a deep well. If the bucket of water weighs 120N,

a) How much work is required to turn the crank?
b) Find the number of turns of the crank required to raise the bucket to the surface if the well is 510m deep.

34. Find the velocity ratio of a wheel and axle system if the load gear has 60 teeth and the driven wheel gear has 20 teeth.

35. A hydraulic machine has a piston P of cross–sectional area $5cm^2$ and Q of cross-sectional area of $50cm^2$. Find the velocity ratio of the system.

36. If the VR of a hydraulic machine is 441 and the effort distance moved by the effort piston is 7m, calculate the load distance.

37. The efficiency of the press is given as 75%. If the radius of the load piston is given as 3m while the effort piston is 1.5m, calculate:

a) The VR
b) The MA of the press

38. A box weighing 560N is pulled along an inclined plane of length 5m onto a platform 2m high with a force of 70N. Calculate:

a) The velocity ratio of the plane
b) The mechanical advantage of the plane.
c) The efficiency of the plane

39. A pulley system has a velocity ratio of 5 and an efficiency of 60%.

a) What effort force is required to lift a 750N object using the pulley?
b) How much work will be done in raising the object through a distance of 1.5m?

40. A hydraulic press has an effort and load pistons with areas $0.02m^2$ and $0.3m^2$ respectively. A force of 550N is required to lift a car with a mass of 680kg using the press. What is the efficiency of the press?

41. (a) In a pulley system, a load of 700N requires an effort of 100N to raise it. What is the mechanical advantage?

(b) If this effort moves through a distance of 10m and the load is then moved up a distance of 2m, calculate the velocity ratio and the efficiency of the machine.

42. A block and tackle pulley system has a velocity ratio of 4. If a load of 200N is raised by using a force of 75N, calculate the mechanical advantage and the efficiency of the system.

43. A block and tackle pulley system consist of 5 pulleys. If the efficiency of the system is 80%, what load will be raised by an effort of 100N?

44. A loaded wheelbarrow of weight 800N is pushed up an inclined plane by a force of 150N parallel to the plane. If the plane rises by 50cm for every 400cm distance measured along the plane, find the velocity ratio, mechanical advantage and the efficiency of the plane.

45. A screw jack with a pitch of 0.2cm and a handle of length 50cm is used to lift a car of weight 12000N. If the efficiency of the screw is 30% find:

a) The velocity ratio and mechanical advantage of the machine
b) The effort required to raise the car

46. A wheel and axle of efficiency 80% is used to raise a load of 2000N. If the radius of the wheel is 50cm and that of the axle is 2cm, calculate:

a) The velocity ratio and mechanical advantage of the machine
b) The effort required to overcome the load

47. A car of mass 980kg is to be lifted by a screw jack of a pitch 6.3mm. If the effort handle is 0.9m long and the efficiency of the machine is 36%, what force must be applied to the machine? (*the force of gravity is 9.8N/kg*)

MOTION IN A STRAIGHT LINE

1. A body starts from rest and accelerates at $2m/s^2$ for 5 seconds. Calculate:-
   a) Its final velocity
   b) The distance it moves

2. A baseball is thrown vertically upwards with a velocity of 20m/s. Find the:-
   a) Maximum height it reached
   b) The time taken to reach the maximum height

3. A body covers a distance of 480m in 6 seconds. Calculate its average speed.

4. A car accelerates from 20m/s to 100m/s in 2s. What is the acceleration?

5. A car with a velocity of 90km/h is uniformly retarded and brought to rest after 10 seconds. Calculate its acceleration.

6. A body moving with a velocity of 30m/s is accelerated uniformly to a velocity of 50m/s in 5 seconds. Calculate:-
   a) The acceleration of the body
   b) The distance travelled by the body

7. A body is released from rest at a certain height above the ground. If the body strikes the ground with a velocity of 60m/s, calculate the height from which the body was released and the time taken by the body to strike the ground.

8. A car accelerates from a speed of 80m/s in 1 minute. It then moves with this speed for 20 seconds and finally decelerates uniformly to stop after another 2 minutes. Draw the velocity – time graph to represent motion of the car and calculate:-
   a) Deceleration of the car
   b) The total distance travelled by the car

9. Two cars A and B are moving at the same time along a straight line with uniform accelerations $5m/s^2$ and $3m/s^2$ respectively. If A is 60km behind B, after how long will car A overtake car B?

10. An object is initially moving at 15m/s to the right. Eight seconds later it is moving at 5m/s to the left. During those eight seconds, what was the object's acceleration?

11. A car brakes and slows down from 20m/s to 5m/s in 3 seconds. What is the vehicle's acceleration?

12. A car starts from rest and is accelerated uniformly at a rate of $4m/s^2$ for 5 seconds. It maintains a constant speed for 20 seconds. The brakes are then applied and the car is brought to rest in the next 3s. Find:-
   a) The maximum speed attained
   b) The total distance covered.

13. A body is projected upward with a velocity of 20m/s and returned to the ground and at the same position after 8s.
   a) Sketch a graph of velocity against time for the motion
   b) From your graph, determine the distance travelled and the total displacement.

14. Amina's car started from rest and travelled for 10 seconds at a speed of 30m/s. she maintained a speed of 30m/s for 10 seconds, after which she applied the brakes and stopped after 5 seconds. Draw the graph of speed against time and calculate:-
   a) The total distance travelled
   b) The time taken for the whole journey

c) The maximum speed attained
d) The area under the graph represented.

15. A car starts to move from rest and accelerates uniformly at the rate of $2m/s^2$ for 6s. It then maintained a constant speed for half a minute. After the brakes are applied, it retards uniformly to rest in 5s. Calculate:-
a) The total distance covered in metres
b) The maximum speed reached

16. A train travelling at 30km/h stops when brakes are applied. The train suffers a deceleration of $2m/s^2$.
a) How long does the train take to come to rest?
b) What is its final velocity?
c) How long does the train take before finally stopping?

17. An object travelling at 10m/s accelerates at $4m/s^2$for 8s.
a) Calculate the final velocity
b) How does it travel for 8 seconds?

18. A car moves with uniform velocity of 12m/s for 6 seconds. After this, it accelerates at $2m/s^2$ for 4 seconds. It then travel for 2 more seconds with uniform velocity. The car finally decelerates to stop in 15 seconds. Calculate:-
a) The distance travelled in 5 seconds
b) Average velocity for the journey, assuming that the whole journey was in the straight line.

19. An object with initial velocity of 20m/s moves due north at an acceleration of $8m/s^2$for 5 seconds. What is the total displacement during that time?

20. A body moved upward a distance of 20m. Calculate:
a) The initial velocity
b) The time to reach the maximum height

21. A stone dropped down a well takes 2s to reach the water surface. Calculate:
a) The velocity with which the stone hits the water
b) The distance of the water surface from the top of the well shaft.

22. A stone is thrown vertically upwards with an initial velocity of 30m/s from the top of the tower 34m high. Find:
a) The time taken to reach the maximum height
b) The total time that elapses before it reaches the ground.

23. A ball is thrown horizontally at 10m/s from a height of 2m above the ground.
a) How long does it take to hit the ground?
b) How far away from the thrower does it hit the ground?

24. A car is travelling at 20m/s along a straight road. After 5s the brakes are applied. If this caused an acceleration of $3m/s^2$, find the car's final velocity.

25. An object is thrown straight up with an initial velocity of 50m/s.
a) How long will it take to reach the maximum height?
b) To what height will it raise?
c) What will be its velocity when starting to its initial point?
d) How long will it be in air?

26. A car travelling at 20m/s to the right stops in 10s.

a) What was the car's acceleration? Give both the magnitude and direction
b) How far did the car travel before stopping?
c) How far did the car have travelled if its initial velocity had been 40m/s?

27. A stone dropped from the top of the building hits the ground 4s later.

a) How tall is the building?
b) What was the stone's velocity when it hits the ground?

28. An object is thrown straight up with an initial velocity of 45m/s. At what two times will the object be 50m above the ground?

29. A car travels with uniform velocity of 30m/s for 5 seconds and then comes to rest in the next 10 seconds with uniform deceleration. Draw a velocity-time graph of the motion. From the graph, find

(i) The deceleration.
(ii) The total distance covered.

30. A car accelerated uniformly form rest for 20 seconds with an acceleration of $1.5m/s^2$. It then travels at constant speed for 2 minutes before slowing down with a uniform deceleration to come to rest in a further 10 seconds.
Sketch a velocity-time graph of the motion. From the graph: Find:-

(i) The maximum speed.
(ii) The total distance travelled
(iii) The acceleration while slowing down

31. Two cars A and B start moving at the same time along straight line with uniform acceleration of $6m/s^2$ and $4m/s^2$ respectively. If the distance of separation between the two cars is 1000m. Calculate

(i) The time taken for car A to overtake car B.
(ii) Distance travelled by car A before to overtake car B
(iii) The velocity of car A when it overtake car B.

32. A car start from rest and accelerates to a velocity of 120 m/s in one minute. It then moves with constant speed for 40 seconds and finally decelerates uniformly to rest after another 2 minute. Draw the motion and calculate:

i) The total distance traveled from the graph.
ii) The total time taken for the whole motion.

33. An iron ball is dropped from the tower of a certain building near a beach and takes 3.5 seconds to reach the sand beach below. Find:

(i) The velocity with which it strikes the sand beach.
(ii) The height of the tower.

34. A car accelerates uniformly from 80m/s to 480m/s in 50sec. It then decelerates to in 100sec.

(i) Draw the velocity time graph.
(ii) Calculate acceleration and deceleration of the car.
(iii) Calculate the total distance travelled by the car.

NEWTON'S LAWS OF MOTION

1. A saloon car of mass 1000kg is moving with a velocity of 60km/h. What is its momentum?

2. A tennis ball whose mass is 150g is moving at a speed of 20m/s. It is then brought to rest by one player in 0.05s. Calculate the average force applied.

3. An unbalanced force of 12N acts on a mass of 12kg. Calculate:

   a) The resulting acceleration
   b) The force that would give a body of 10kg the same acceleration

4. A body at rest is acted upon by a force for 20 seconds. The force is then withdrawn and the body moves a distance of 60m in the next 5 seconds. If the mass of the body is 10kg, calculate the magnitude of the force.

5. A train of mass 22 400kg moving at the rate of 112km/h is brought to rest in 24 seconds by the action of the brakes. Calculate the braking force.

6. A trolley of mass 5kg rests on a smooth horizontal track. A forward force of 4.5N is applied to the trolley. Find the acceleration of the trolley.

7. A car moves with an acceleration of $5m/s^2$. If its mass is 2000kg, find the force with which the car is moving.

8. A rocket of mass 20000kg is launched by applying a force of 5000000N for 20 seconds. Calculate the velocity it attains at the end of the 20 seconds.

9. Calculate the average force needed to change the velocity of a 20000kg bus from rest to 13.6m/s in 20 seconds.

10. A car of mass 1800kg is moving at an initial velocity of 20m/s. It hits a wall and stops after covering 1.8m. What is the average stopping force that the wall applied on the car?

11. A 1000kg car collides with a 5000kg truck. During the collision, the truck exerts a force of 10000N on the car. What are the accelerations of the car and the truck?

12. A 4kg object is moving to the right at 2m/s when it collides elastically head-on with a stationary 6kg object. After the collision, the velocity of the 6kg object is 1.6m/s to the right.

   a) What is the velocity of the 4kg object after the collision?
   b) What is the total kinetic energy before and after collision?

13. A trolley A of mass 1.5kg is travelling at 6m/s. It collides with a stationary trolley B of mass 2kg. After the collision, the two continue travelling together at 3m/s.

   a) What is the momentum of A before collision?
   b) What is the momentum of A after collision?
   c) Why is there a change in the momentum of A?
   d) What is the kinetic energy of each trolley after the collision?

14. A heavy car of 2000kg, travelling at 10m/s, has a head-on collision with a sport car B of mass 500kg. If both cars stopped dead on colliding, what was the velocity of B?

15. What is the resultant force needed to accelerate a space shuttle of mass 3000000kg from rest to 600m/s in 33 seconds?

16. A car of mass 1200kg is brought to rest by a uniform force of 300N in 80 seconds. Find the speed at which the car was moving.

17. A body of mass 8kg moving with a velocity of 20m/s collides with another body of mass 4kg moving with a velocity of 10m/s in the same direction. The velocity of the 8kg body is reduced to 15m/s after the collision. If the bodies don't stick together after the collision, calculate the final velocity of the 4kg body.

18. After striking its target, a bullet of mass 50g is brought to rest in 2 seconds by a force of 300N. Calculate the velocity of the bullet before striking the target.

19. A soldier fires a bullet of mass 200g from a gun of mass 5kg. The bullet leaves the gun with a velocity of 100m/s. Find the average force exerted on the gun given that the recoil of the gun lasted for 2 seconds.

20. A shot of mass 100kg leaves a cannon of mass 5 tonnes with a velocity of 100m/s. Find the velocity of recoil of the canon.

21. A shell of mass 30kg is fired at a velocity of 600m/s from a gun of mass 7000kg. How many dots would have been printed on the tape?

22. A projectile of mass 400g moving at 600m/s hits movable target of mass 20kg, which is at rest. The projectile and the target move on together after the impact. Find: -

a) the momentum of the projectile
b) the combined velocity just after the impact

23. Two jet fighters of the same mass collide head-on and become tangled so that they move on together. If the engines of both were stopped at the moment of impact and the speed of the jets at impact were 120 m/s and 200 m/s, find the joint velocity immediately after collision.

24. A 900 kg bus starts from rest and acceleration uniformly at 5 m/s2 for 10 seconds. Calculate:

i) The velocity of the bus in the 8^{th} second.
ii) The momentum of the bus in the 5^{th} second.
iii) The force of the bus

25. Two identical trolleys are on a smooth horizontal plane. One trolley is at rest and the other approached it at a constant speed of 20m/s. After impact the two trolleys move together. What is their velocity?

26. A boy with mass 50kg running at 5m/s jumps on to a 20kg trolley travelling in the same direction at 1.5 m/s. What is their common velocity?

27. The velocity of a body of mass 10kg increases from 4m/s to 8m/s when a forces acts on it for 2 sec. What is

(a) (i) The momentum before the force acts?
(ii) The momentum after the force acts.
(iii) The momentum gain per second?
(iv) The value of the force?

28. A bullet of mass 250g is fired from a gun of mass 5kg exerting a force of 30N against the gunman which persisted for two seconds. Find the velocities of the bullet and recoil of the gun.

LAWS AND PRINCIPLES IN PHYSICS ***(FORM ONE AND FORM TWO)***

1. State the principle of conservation of mass

'*Mass can neither be created nor destroyed'.*

2. State the Archimedes' principle

'*When a body is partially or totally immersed in a fluid, it experiences an upthrust which is equal to the weight of the fluid displaced'.*

3. State the law of flotation

'*A floating body displaces its own weight on the fluid in which it floats'.*

4. State Hooke's law.

'*Within the elastic limit, the extension of the spring is directly proportional to the applied force, provided that the elastic limit is not exceeded'.*

5. State the Pascal's principle of the hydraulic press

'*Any external pressure applied to the surface of an enclosed liquid will be transmitted equally throughout the liquid'.*

6. State the principle of conservation of energy

'*Energy can neither be created nor destroyed, but it can be transformed from one form to another'.*

7. State the first and second Laws of reflection of light.

First Law: *'The incident ray, the reflected ray and the normal, all lie on the same plane'*

Second Law: '*The angle of incidence is equal to the angle of reflection'*

8. State the fundamental law of static electricity

'*Like charges repel while unlike charges attract each other'.*

9. State Ohm's law

'*At a constant temperature and other physical factors, a current passing through a wire is directly proportional to the potential difference across its ends'.*

10. State the basic law of magnetism

'*Like poles repel while unlike poles attract each other'.*

11. State the principle of moments

'*For a system to be in a rotational balance, the total clockwise moment must be equal to the total anticlockwise moment'.*

12. State Newton's first Law of motion

'*A body in motion continues in motion at a constant speed in a straight line and that at rest remains so unless it is acted on by an external force'.*

13. State Newton's second Law of motion

'*The rate of change of momentum of the body is directly proportional to the net force and takes place in the direction of the force'.*

14. State the principle of conservation of linear momentum

'*If there is no any external force acting on a colliding system, total momentum before collision is equal to the total momentum after collision'.*

15. State Newton's third Law of motion

'*For every action, there is an equal and opposite reaction'.*

FILLING THE BLANKS – QUESTIONS

1. When a body is immersed in……..the ……of the body is equal to the weight of ……

2. When a bar magnet is freely suspended, the ……..pole tends south and the …….pole tends north.

3. Energy can…….be created nor destroyed

4. A wheel barrow is a ……class lever.

5. A……..is used to measure small forces.

6. The force that causes the volume and size of the objects to decrease is known as…….

7. The weight of a body in air is called…….while the loss in weight when a body is partially or totally immersed in water is known as……

8. ……...force prevents a body from sliding.

9. The tendency of a body to remain suspended in a fluid is called……..

10. The ability of a material to return to its original size and shape after deformation is called…….

11. ……is the attraction between the molecules of the same substance while……is the force of attraction between the molecules of different substances.

12. The ability of a material to behave like a fully stretched elastic skin is called……..

13. The cleaning action of a soap is due to the property known as……..

14. The rise or fall of liquid in a narrow tube is called……..

15. The elastic force constant of a spring is obtained by the ratio between…….and……

16. The bicycle pump works under the application of……..pressure.

17. Upward force in liquid is called……..

18. Mass is a measure of quantity of …….in a body.

19. The instrument used to convert electrical energy into sound energy is called……..

20. The type of frictional force experienced by a spherical body moving in water is called……..

21. The weight of a body when in water is called……

22. The quantity of space that an object occupies is called……

23. According to Archimedes' principle, upthrust is equal to……

24. A physical quantity measured by using thermometer is referred to as……

25. Basic physical proportions of measurement which cannot be obtained from any other proportions by either multiplication or division are called……..

26. Weight has the same SI unit as……

27. The instrument used to measure the pressure of a gas is known as…….

28. The hydrometer is used to measure……..

29. The force which causes wear and tear between machine parts is known as…….

30. ……is an instrument used to measure length of the objects in the order of 0.01cm.

32. The least count of measurement of a micrometer screw gauge is ……...cm

33. Water can exist in three states namely……., …….and……

34. ……reflection occurs in a rough surface.

35. The instrument that is used to see over an obstacle from a concealed position is known as…….

36. The objects which emit light when they are hot are called……..

37. ……..is used to identify the presence of charge on an object.

38. In the graph of voltage against current to verify Ohm's law, the slope of the graph always represents……..

39. The ability of a material to store charge is measured in…….

40. The instrument used to store charge is called….....

41. Materials which impede the flow of electrons from one atom to another are called……

42. Lightning is the……of static electric charge between the clouds.

43. A glass rod rubbed with…….becomes …….charged.

44. Series arrangement of capacitors gives……value of the capacitance.

45. To prevent a building from lightning strikes, a ……..is attached to the building.

46. The SI unit of charge is……

47. When the cross-sectional area of the conductor is increasing then …….tends to decrease.

48. Magnetic field is the……..around a…….

49. The process of limiting the flow of magnetic fields between two locations by separating them with a barrier made up of conducting material is known as…….

50. The point where the net magnetic field is zero is called…….

51. Length of the conductor, cross sectional area, temperature and…… are the factors affecting the resistance of a conductor.

52. For a system to be in rotational balance; when the clockwise moment is 40Nm then the anticlockwise moment must be……

53. When the displacement of the object does not alter the position of equilibrium, the body is in……equilibrium.

54. Velocity ratio of the wheel and axle is taken as the ratio of …….to the……

55. In .....pulley, the velocity ratio is always 1.

56. Mechanical advantage is always less that velocity ratio because…….. while ……by friction.

57. In velocity-time graph, the slope of the graph always represents…….

58. The total distance covered in velocity-time graph is represented by….....

59. According to the Newton's second law, the product of the mass and acceleration implies……

60. In…….collision, total kinetic energy is not conserved.

ANSWERS

1. *Fluid, weight, the fluid displaced*
2. *North, South*
3. *Neither*
4. *Second*
5. *Spring balance*
6. *Compressional force*
7. *Real weight, Apparent loss in weight*
8. *Frictional*
9. *Floating*
10. *Elasticity*
11. *Cohesion, Adhesive force*
12. *Surface tension*
13. *Surface tension*
14. *Capillarity*
15. *Tension, Extension*
16. *Atmospheric*
17. *Upthrust*
18. *Matter*
19. *Microphone*
20. *Viscosity*
21. *Apparent weight*
22. *Volume*
23. *Weight of the fluid displaced*
24. *Temperature*
25. *Fundamental quantities*
26. *Force*
27. *Barometer*
28. *Relative density of liquid*
29. *Frictional force*
30. *Vernier caliper*
31.
32. *0.001*
33. *Solid, liquid and gas*
34. *Irregular/diffuse*
35. *Periscope*
36. *Incandescent*
37. *Gold leaf electroscope*
38. *Resistance*
39. *Farad*
40. *Capacitor*
41. *Insulators*
42. *Discharge*
43. *Silk, positively*
44. *Small*

45. Lightning conductor

46. Coulomb

47. Resistance

48. Region, magnet

49. Magnetic shielding

50. Neutral point

51. Type of material

52. 40Nm

53. Neutral

54. Radius of the wheel to the radius of the axle

55. Single fixed

56. Mechanical advantage is affected by friction while velocity ratio is not affected

57. Acceleration

58. Area under the graph

59. Net force

60. Inelastic

……..THE END…….....

Best Wishes on Your Upcoming Examinations

Just do your Best And God will do The Rest

By Mr. Wans

2018