

Mechanics and basic electricity

1. What is the definition of capacitance?
2. What does n mean in the equation $I = nAve$
3. What is the definition of a volt?
4. What is the definition of electromotive force (e.m.f)?
5. What is the definition of the moment of a force?
6. If three forces are in equilibrium what can you say about them?
7. A car travels round a banked circular frictionless track. What is the force that provides the centripetal force to keep it moving in a circle?
8. How does the potential difference across:
 - (a) two equal resistors connected in parallel compare with that across one of them?
 - (b) two different resistors connected in parallel compare with that across one of them?
9. What is meant by internal resistance?
10. What is the formula for impulse?
11. How would you calculate the braking force of a car with velocity v ?
12. Give an equation for the drag force on a parachute for a parachutist falling at terminal velocity.
13. Give a formula for the resistivity of a material.
14. What is the component of a force F in a direction at angle A to that force?
15. A boat floats in water. What is the upthrust on that boat? (Numerical value not required here)
16. A lorry travels at a constant speed of 30 ms^{-1} on a level road. If the drag forces total 2000 N what is the power of the engine of the lorry?
17. Draw a sketch to show the forces acting on a skier travelling down a slope which has some friction.
18. What factors affect the pressure in a liquid?
19. Why is electricity transmitted at high voltage?
20. What are the units for power?
21. What factors affect the force produced by a jet of water?
22. What is the work done by a gas at atmospheric pressure (10^5 Pa) when its volume is increased by 0.5 m^3 ?
23. Give three examples of:
 - (a) Vectors
 - (b) Scalars
24. Give an example of the product of two vectors giving a scalar
25. Give one example of the product of a vector and a scalar giving a vector
26. Explain what happens to the resistance of a wire as its temperature rises.
27. A graph is plotted of charge against time for the discharge of a capacitor. How can the current at any time be found?
28. A graph is plotted of current against time for the discharge of a capacitor. How can the charge passed be found?
29. A moving ball collides with and sticks to a stationary ball. What is conserved in the collision?
30. What is meant by the breakdown potential for a capacitor?
31. What is meant by **non-ohmic behaviour**?
32. Give one domestic appliance that might contain a **thermistor**.
33. Two balls collide. If the force of ball A on ball B is F what is the force of ball B on ball A?
34. A capacitor of capacitance $0.47 \mu\text{F}$ is charged to a potential of 400V . Calculate:
 - (a) The energy stored in it
 - (b) The mean current if it discharges in 0.01s
35. From a velocity time graph how would you find:
 - (a) The acceleration?
 - (b) The distance travelled in 2.3s ?
36. Explain the difference in energy between a coulomb of charge delivered by either the mains (240V) or a car battery (12V)
37. Three resistors ($10 \text{ k}\Omega$, $10\text{k}\Omega$ k and $20 \text{ k}\Omega$) are joined in series to a 12 V supply.

What is the voltage across:

- (a) One of the 10 k Ω resistors
- (b) The 20 k Ω resistor

38. A car travels 15 km at a constant velocity of 30 ms⁻¹ against a resistive force of 750N.

- (a) What energy does it consume in its journey?
- (b) The power of the engine

39. The filament a light bulb gets thinner with use. What happens to its resistance as a result of this?

40. What is a **free electron**?

41. Why is **internal resistance** of a source a useful safety factor?

42. Explain the term – negative temperature coefficient of resistance.

43. Give an example of a material that has a negative temperature coefficient of resistance

44. What is:

- (a) the SI unit of torque?
- (b) express it in base units.

45. Explain what is meant by a couple.

46. Give one disadvantage of laying power cables underground.

47. Define electrical resistance.

48. A 2A fuse connected to a 12V 24W lamp and is found to blow immediately the lamp is switched on. Why?

49. What happens to the path of a projectile dropped from a plane if air resistance is taken into account?

50. A stone is swung round on the end of a string.

- (a) In which direction does the force on the stone act?
- (b) In which direction does the stone travel if the string breaks?