

PRIFYSGOL BANGOR
BANGOR UNIVERSITY

ARHOLIADAU YSGOLORIAETHAU MYNEDIAD 2025
SCHOLARSHIP ENTRANCE EXAMINATIONS 2025



PWNC / SUBJECT: FFISEG / PHYSICS

Amser a ganiateir: 2 awr

Time allowed: 2 hours

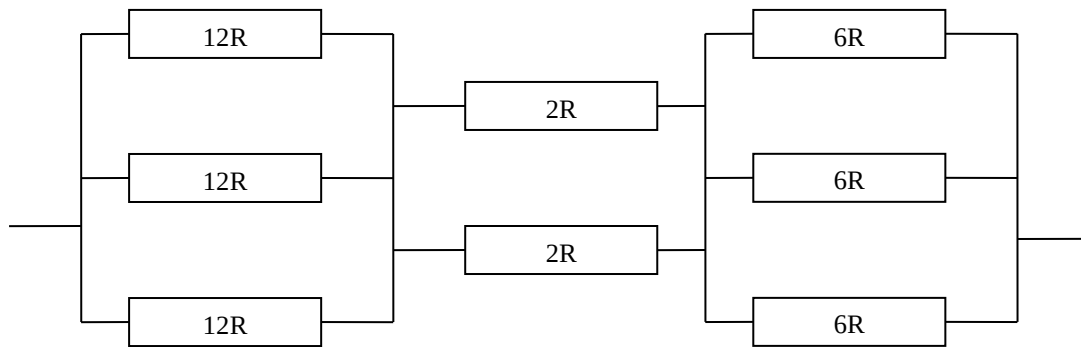
Cyfarwyddiadau / Instructions:

You may attempt any of the questions. Credit will be given for complete answers.

Assume $g = 9.8 \text{ m.s}^{-2}$

1. Given the equation $R = \rho \frac{l}{A}$ where R is the resistance in ohm of an electrical conductor with length l in metre and cross-sectional area A square metre, find the units of the quantity ρ . What is the significance of the quantity ρ in practice? How does this equation explain the rule for calculating the total resistance of a parallel combination of resistors?
2. State the conditions for equilibrium for a mass acted on by forces. What is the magnitude of the friction force that would stop a 1.0 kg mass from slipping down a slope of 60 degrees? Draw a diagram of the problem, indicating the magnitudes and directions of the forces.
3. With reference to the idea of the moment of a force, explain why a door handle is usually attached to the door on the side opposite to the hinge.
4. Two cars, initially separated from each other by a distance of 500 m approach each other on a collision course. One car travels at 30 m.s^{-1} , the other at 20 m.s^{-1} . By plotting a distance/time graph find the position at which the collision takes place. How long after the cars start does the collision happen?
5. Explain the concept of terminal velocity of a falling body. Why is it that bodies with the same mass but different shapes can have different terminal velocities? What happens if a body is given an initial velocity greater than its terminal velocity?
6. Describe, at a molecular level, the main features of the force/extension graph of a glass rod.
7. Describe an experiment which demonstrates the interference of two light sources.
8. Describe the concept of total internal reflection, and explain how the phenomenon is used in optical fibre communications. Give one advantage of optical communications systems over electrical communications systems.
9. State the meaning of each symbol in the equation $I = nAve$ for free electrons in a conductor. Derive the equation, showing clearly the steps in your derivation.

10. What is the total resistance, as a multiple of R , of the following network of resistors?



11. Consider the series connection of a resistor of resistance R and a capacitor of capacitance C . By means of a phasor diagram, find the phase difference between the applied voltage and the voltage appearing across the capacitor if $R = 100 \text{ ohm}$ and $C = 1 \text{ } \mu\text{F}$ and the input voltage is of frequency 50 Hz .
12. Given that the resistance of a 15cm length of Kanthal (FeCrAl) wire of diameter 0.55 mm is 0.88 ohm , find the resistivity of Kanthal.
13. Discuss the assertion that all energy consumed by humankind is ultimately from the sun.
14. A 30 g mass is fired with velocity 1 m.s^{-1} at another, identical mass which is initially at rest. Given that the two masses travel together with velocity 0.05 m.s^{-1} after they collide, calculate the energy lost during the collision. To what form is that energy likely to have been converted?