iGCSE Physics Specification Questions

Forces and Motion

1. What does the gradient of a distance-time graph represent?
2. State the equation linking average speed, distance moved and time.
3. State the equation linking acceleration, change in velocity and time.
4. What does the gradient of a velocity-time graph represent?
5. What does the area under the line of a velocity-time graph represent?
6. What three effects can a force have on an object?
7. What is the difference between a vector and a scalar quantity?
8. If a car engine gives 300 N of thrust forwards and there is 100 N of drag, what will be the resultant force? What will happen?
9. What is friction?
10. What is the equation that relates resultant force, mass and acceleration?
11. What is the equation that relates weight, mass and acceleration due to gravity?
12. Describe what happens to an object as it falls in terms of the forces acting on it and its motion.
13. What equation relates stopping distance, thinking distance and braking distance?
14. What factors affect thinking distance?
15. What factors affect braking distance?
16. **What is the relationship between momentum, mass and velocity?**
17. **How does a car safety belt reduce injuries?**
18. **What is the law for conservation of momentum? Describe an example where it can be used to calculate the motion of objects after a collision or explosion.**
19. **What is the equation linking force, change in momentum and time taken?**

20. **What is Newton's third law?**
21. What is the relationship between the moment of a force and its distance from the pivot?
22. What is the centre of gravity of an object?
23. **What is the principle of moments? How can it be used to determine the effect of parallel forces acting in one plane?**
24. What happens if you apply a range of forces to an object such as a spring, a metal wire or an elastic band?
25. What is Hooke's Law? How can it be demonstrated graphically?
26. What is elastic behaviour?
27. Why does an Astronaut weigh less on the Moon than on Earth but more if they were on the Surface of Jupiter?
28. What causes planets to orbit the Sun?
29. What is the difference between the orbit of a planet or a moon and the orbit of a comet?
30. What is the equation that links orbital speed, orbital radius and time period?
31. Put these in order of size from smallest to largest: Milky Way galaxy, Earth, Hackney, Mossbourne and the Universe.

Electricity

1. How many electrical hazards can you spot?

2. How can insulation, earthing, fuses and circuit breakers be used to reduce electrical hazards?
3. How can a resistor be used as a heater?
4. State the equation that relates power, current and voltage.
5. What is the equation that links energy transferred, current, voltage and time?
6. What is the difference between alternating current and direct current?
7. Which is more appropriate for a domestic lighting circuit, series or parallel?
8. What happens to the current running through a series circuit if more voltage is applied?
9. What happens to the current running through a series circuit if more components are added?
10. Draw graphs to show how current varies with voltage in wires, resistors, filament lamps and diodes. How would you investigate these graphs experimentally?

11. What happens to the resistance of an LDR if the light level drops?
12. What happens to the resistance of a thermistor if the temperature drops?
13. How could you use a diode to show which direction current is flowing around a circuit?
14. What is the equation that relates voltage, current and resistance?
15. What is current?
16. What is the relationship between charge, current and time?
17. **What is voltage?**
18. What is a conductor? What is an insulator? Give three examples of each.
19. **Describe an experiment where an insulating material can be charged by friction.**
20. **If a material has become positively charged, what has happened?**
21. **What happens when like charges are placed close to one another? What happens when unlike charges are places close to one another?**
22. **What are the risks of fuelling aircraft and other large vehicles and how can they be minimised?**
23. **How does a photocopier work?**

Waves

1. What is the difference between a longitudinal and a transverse wave?
2. Define amplitude, frequency, wavelength and the period of a wave?
3. Do waves transfer energy and matter?
4. What is the equation that relates wave speed, wave length and frequency?
5. What is the relationship between time period and frequency?
6. **What is diffraction?**
7. **Draw a diagram of diffraction comparing bass with treble. Label the wavelength.**
8. **Draw a diagram of diffraction comparing red light with blue light. Label the wavelength.**
9. What are the parts of the electromagnetic spectrum from longest wavelength to shortest wavelength?
10. What properties do all parts of the electromagnetic spectrum have in common?
11. What are the uses of electromagnetic radiation?
12. What are the risks of electromagnetic radiation and how can they be avoided?
13. What is the law of reflection?
14. What is a virtual image?
15. Draw a diagram of an object and a virtual image using four lines and a reflective surface.
16. What is the equation relating refractive index, angle of incidence and angle of reflection?
17. How would you find the refractive index of a glass block?
18. Why are optical fibres better than copper wire for transmitting information?
19. Draw a diagram of total internal reflection down an optical fibre.

20. What is the critical angle c?
21. What is the relationship between the critical angle and the refractive index?
22. What type of a wave is sound?
23. What is the frequency range of human hearing?
24. How could you measure the speed of sound in air?
25. Draw a diagram comparing a loud, high frequency sound to a quiet, low frequency sound.

Energy resources and energy transfer

1. What are the 9 forms of energy? Put them in a table with two headings: kinetic and potential.
2. What is the law of conservation of energy?
3. What is the equation for efficiency?
4. Sketch a Sankey Diagram of a light bulb that is 30% efficient.
5. What is conduction?
6. What is convection?
7. What is radiation?
8. How can insulation be used to reduce energy transfer by conduction, convection and radiation?
9. What is the relationship between work, force and distance moved in the direction of the force?
10. What is work done?
11. What is the equation relating gravitational potential energy to mass, the acceleration due to gravity and height?
12. What is the equation relating kinetic energy to mass and velocity?
13. Describe the energy transfers of a falling object considering the law of conservation of energy.
14. What is power?
15. What is the equation relating power, work done and time?
16. Draw up a table of advantages and disadvantages including each of these energy resources: wind, water, geothermal, solar heating systems, solar cells, coal, oil, gas and nuclear power.

Solids, Liquids and Gases

1. What is the equation that links density, mass and volume?
2. How would you measure the density of tap water?
3. What is the equation that links pressure, force and area?
4. What is the equation that relates pressure difference, height, density and gravitational field strength?
5. What is Brownian motion?
6. How do gas molecules exert a pressure on the walls of a container?
7. What temperature in ^{o}C is absolute zero?
8. Why can't you get below absolute zero?
9. How do you convert from ^{o}C to K and from K to ^{o}C?
10. What happens to the average speed of gas molecules if you increase the temperature?
11. What is the equation that relates pressure and Kelvin temperature?
12. What is the equation that relates pressure and volume for a fixed mass of gas at constant temperature?

Magnetism and electromagnetism

1. Draw a magnetic field pattern for a permanent bar magnet and between two bar magnets in both like and unlike pole arrangements.
2. What two experiments could be used to find the magnetic field pattern of a magnet?
3. How can you produce a uniform magnetic field?
4. What is produced when a wire carries an electric current?
5. What can you use to work out the direction of a field around a current carrying wire?
6. What law governs the direction of a force exerted on a current carrying wire in a magnetic field?
7. How can you increase the strength of a force on a current carrying wire in a magnetic field?
8. Describe how a D.C. motor works.
9. Describe how a loudspeaker or a microphone works.
10. What happens when a conductor or coil is moved through a magnetic field or when a magnetic field moves through a conductor or coil?
11. What factors affect the size of a voltage induced in a coil?
12. **Draw a labelled diagram of a transformer.**
13. **Explain the difference between a step-up and step-down transformer.**
14. **What is the equation that relates input (primary) and output (secondary) voltages to the turns ratio of a transformer.**
15. **What is the equation that relates input power to output power for a 100% efficient transformer?**

Radioactivity and particles

1. Draw a labelled diagram of an atom.
2. What does this $^{14}_{6}C$ mean?
3. What do the terms atomic number, mass number and isotope mean?
4. Draw a table comparing the following properties of alpha, beta and gamma radiation: form, source, charge, mass, speed, ionising power and penetration.
5. Write out an example of a decay equation for each of the three main types of radiation.
6. How does a Geiger-Muller detector work?
7. Where does background radiation come from?
8. What is activity and what is it measure in?
9. How does the activity of a radioactive source reduce over time?
10. What is meant by the term half-life?
11. If it takes 120 years for the activity of a radioactive source to reduce by 50%, what is the half-life of the source?
12. Describe two uses of radioactivity.
13. Describe the dangers of radiation and how these risks can be reduced.
14. Describe Geiger and Marsden's gold foil alpha particle experiment.
15. How did Geiger and Marsden's findings over the deflection of alpha particles lead to Rutherford's nuclear model of the atom?
16. Describe the process of nuclear fission with a series of labelled diagrams.
17. What is a chain reaction?
18. Draw a labelled diagram of a nuclear fission reactor and explain the role played by the control rods and moderator.

Describing Experiments

1. How can you check if results are reliable?
2. What makes results valid?
3. How can you improve validity?
4. What is an independent variable?
5. What is a dependent variable?
6. What is a control variable?
7. How can you improve reliability?

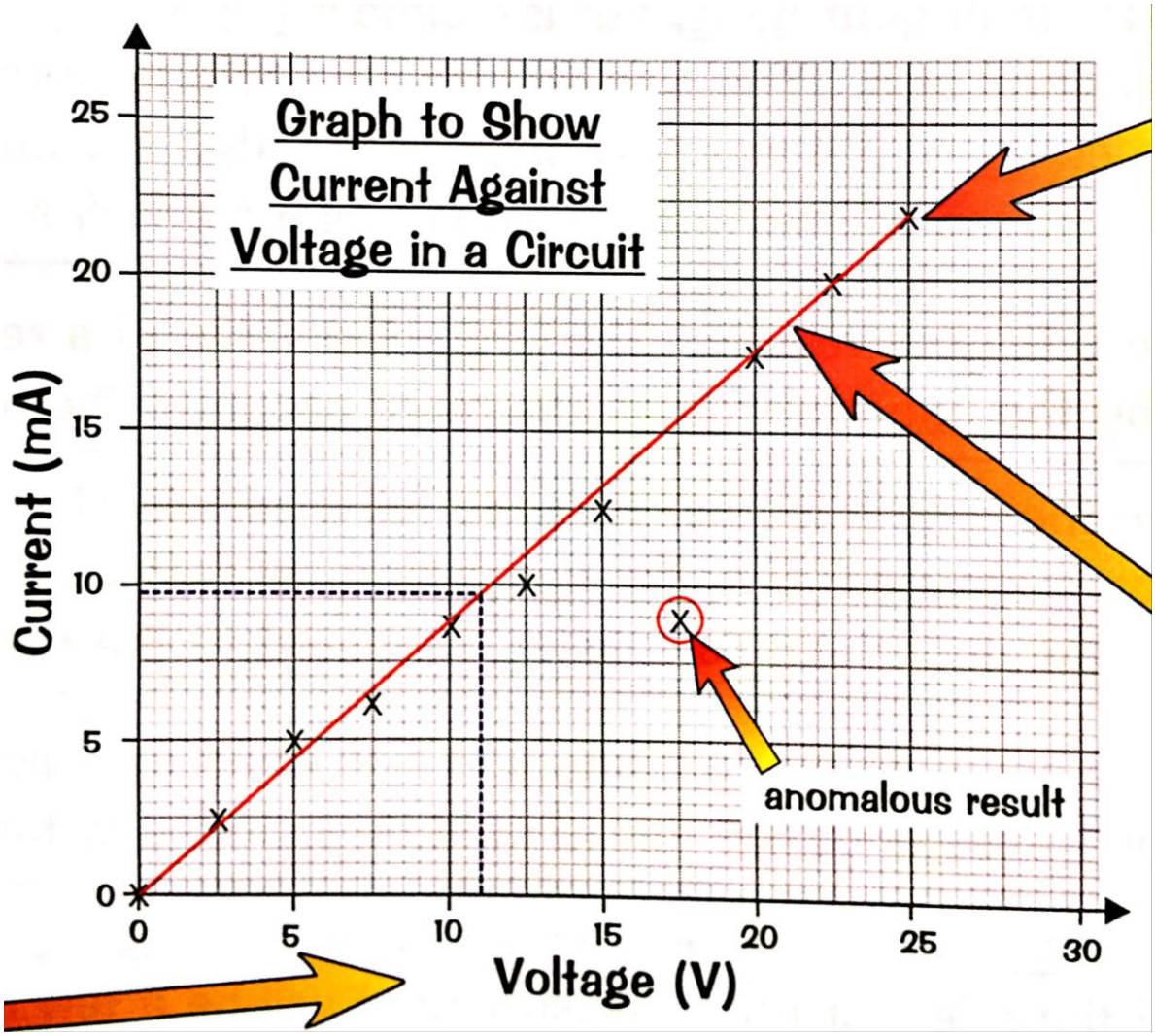
8. Complete the table of examples of potential hazards and how the risks could be reduced.

Experiment	Hazard	Risk reduction
Radioactivity	Exposure can damage cells	Limit exposure time Increase separation from sources Use protective screens to absorb radiation
Spring extension		
Electricity		

9. What does it mean if results are accurate?
10. What is uncertainty?
11. What might you do to improve the accuracy of an experiment? Give 4 examples.
12. What is precision?
13. What is the precision of this piece of data? (13.06)
14. What is an anomalous result?

15. What can cause an anomaly?
16. How would you identify an anomaly in a set of data?
17. Should you include anomalies when calculating averages?
18. What is the difference between categoric and continuous data?
19. For what type of data should you draw a bar graph?
20. For what type of data should you draw a line graph?
21. When drawing a graph what 6 things do you need to remember?

Use this graph for the following two questions



22. Describe the relationship between the voltage and the current?

23. What is the current when the voltage is 22.5 V?

24. Justify why this answer is worth 6 marks by highlighting and annotating the answer to the following question:

Exam-style Question:

1 Describe an investigation to find how the type of surface under a wood block affects the force needed to slide the block across the surface. (6)

Example Answer:

Set up a wood block with a hook firmly attached to the centre of one of the faces, so that a newton meter can be attached. Choose three different surfaces to place the block on, making sure they're all flat and horizontal.

Take a newton meter and calibrate it by suspending masses from it with a known weight and writing down the force shown. This will ensure its readings are accurate.

Place the wood block on the first surface you're testing, and hook a newton meter onto the block. Pull gently on the block using the newton meter in the horizontal direction until the block starts to move. Write down the force shown on the newton meter at this point. Repeat this experiment at least three times and calculate an average reading, discounting any anomalous results.

Do the same again for each type of surface you're investigating. Between testing each surface, suspend one of the weights used for the initial calibration from the newton meter and check the reading is still the same. This will show whether the newton meter is still giving accurate readings.

You could use a spirit level to make sure the surfaces are flat and horizontal.

Drawing a diagram of your experiment might be helpful.