

X-Rays & Ultrasound

1 Explain why it would not be safe to use X-rays to produce an image of an unborn child.

Because X-rays are ionising and kill cells or damage cells which can lead to cell mutations and cancer.



X-Rays & Ultrasound

2 Give one use of ultrasound for medical treatment.

Removing kidney stones, repair of damaged tissue/muscles, removing plaque from teeth



X-Rays & Ultrasound

3 Before switching on the X-ray machine, a radiographer goes behind a screen. Why?

X-rays are ionising. Any stray X-rays are absorbed by the screen so the dose received is less for the radiographer.



X-Rays & Ultrasound

4 Explain the advantage of a CT scan compared to an X-ray.

CT scan can give a 3D image so the image can be observed from different directions.



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5 Explain why a radiographer might wear an apron lined with lead.

X-rays do not go through lead which means the radiographer's cells will not be killed/damaged.



X-Rays & Ultrasound

6 Why can X-rays be used to take pictures of bones?

Because they pass through tissue but are absorbed by bone.



X-Rays & Ultrasound

7 What is ultrasound?

Sound with frequency above 20 000 hertz / 20 kHz; frequencies above (human) audible range



X-Rays & Ultrasound

8 What is the range of frequencies most humans can hear?

From 20Hz to 20,000Hz



X-Rays & Ultrasound

9 Explain why ultrasound can be used to clean jewellery immersed in cleaning fluid.

Fluid particles vibrate and knock off dirt particles.



X-Rays & Ultrasound

10 Give an industrial use for ultrasound.

Cleaning of delicate objects such as jewellery.



X-Rays & Ultrasound

11 What happens to ultrasound which reaches the boundary between two different media and is not reflected?

It is absorbed and transmitted.



X-Rays & Ultrasound

12 Why can a dog hear a dog whistle but humans cannot?

The frequency is too high and in the ultrasound region.



X-Rays & Ultrasound

13 Explain how ultrasonic waves are used to produce the image of an unborn baby.

Waves are partly reflected when they hit a boundary between two different media or substance or tissue. The time taken for a reflected wave to return is used to produce the image.



X-Rays & Ultrasound

14 Write down the equation that links frequency, wavelength and wave speed.

wave speed = frequency × wavelength



X-Rays & Ultrasound

15 Why is it important to have a very narrow beam of ultrasound waves when taking an ultrasound?

to show detail or to give a clear image/picture



X-Rays & Ultrasound

16 Why is it possible to produce a very narrow beam with ultrasound but not with normal sound waves?

It has a much smaller wavelength.



X-Rays & Ultrasound

17 Give two important pieces of information about an unborn baby which can be gained from the image produced by an ultrasound scan.

Sex, abnormalities, stage of development, general health, potential birth problems, size of head, multiple births



X-Rays & Ultrasound

18 Sound travels through air, water and glass at different speeds. Through which of these materials does sound travel fastest/slowest?

Fastest: Glass; slowest: air; the closer the particles, the faster sound travels



X-Rays & Ultrasound

19 Why can ultrasound be used to measure the thickness of a layer of fat on a pig?

Because ultrasound is reflected back at the fat-muscle boundary.



X-Rays & Ultrasound

20 Why are we able to see the different parts of the foetus in an ultrasound scan?

Different tissues have different densities which means ultrasound travels at different speeds. The time taken to travel back after reflection at different tissue boundaries differs.



Lenses & Light

21 Describe how the image formed by the lens in a camera is different from the image formed by a lens used as a magnifying glass.

In a camera the image is real, inverted and diminished not virtual, upright or magnified.



Lenses & Light

22 What name is given to the type of lens used as a magnifying glass?

Converging/convex



Lenses & Light

23 Name a light detecting device which may be used in a camera.

Photographic film or CCD/CMOS



Lenses & Light

24 Which part of the eye changes size to make sure the correct amount of light enters the eye?

Iris/pupil



Lenses & Light

25 What is the function of the ciliary muscles inside the eye?

To change the size/curvature of the lens.



Lenses & Light

26 What is the function of the lens inside the eye?

To focus the light onto the retina.



Lenses & Light

27 The process by which the cornea and lens change the direction of the light is called what?

Refraction



Lenses & Light

28 Give two similarities between an eye and a camera.

Both use a converging lens, both form an image that is real and inverted



Lenses & Light

29 Which device passes light through optical fibres to produce images of the inside of the body?

Endoscope



Lenses & Light

30 Give a medical use for a laser.

Eye surgery



Lenses & Light

31 How does total internal reflection occur?

When the angle of incidence is greater than the critical angle.



Making things work

32 A plumb line always hangs so that it is....?

Vertical



Making things work

33 How can you make an object more stable?

Lower the centre of mass and give it a wide base.



Making things work

34 Use the terms 'line of action of the weight' and 'resultant moment' to explain why a stable concrete mixer does not fall over when it is given a small push.

The line of action falls inside the base and resultant moment will return the mixer to the original position.



Making things work

35 What is the unit for time period?

second



Making things work

36 How does using a shorter piece of rope for a swing change the time period?

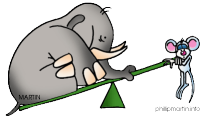
Decreases the time period.



Making things work

37 Where is the centre of mass of a tyre?

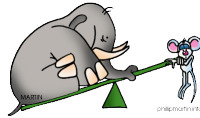
In the centre of the tyre because this is where the axes of symmetry cross.



Making things work

38 What goes in the gap: A suspended object will come to rest with its centre of mass directly.....the point of suspension.

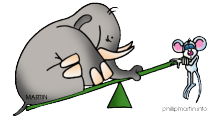
below



Making things work

39 What is meant by the centre of mass of an object?

The point at which the mass seems to act/ point at which gravity seems to act.



Making things work

40 When packing a suitcase, why should you put the heaviest items at the end where the wheels are?

It lowers the centre of mass so the suitcase is more stable when pulled; the turning effect is less so the pull on your arms is less.



Making things work

41 What is the meaning of the term moment?

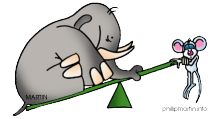
Turning force



Making things work

42 What does the term stable mean in physics?

The centre of mass remains above the base.



Making things work

43 Explain why using a longer steel bar would make it easier for a gardener to lever a tree stump out of the ground.

The force is applied further from the pivot which causes an increased moment to act on the steel bar and therefore an increased force acts on the tree stump.



Making things work

44 Give two ways in which you can increase the turning effect of a spanner.

Lengthen the spanner or apply a bigger force.



Making things work

45 Explain why there are large concrete blocks at the end of a crane behind the operator's cabin.

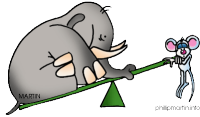
The mass of the concrete blocks can be altered depending on the mass of the object lifted so that the crane remains stable and the total clockwise moment = total anticlockwise moment and the centre of mass of the crane remains above the base.



Making things work

46 Why can liquids be used to transmit the forces in a brake system?

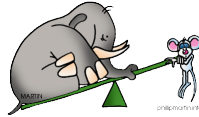
Because they are incompressible.



Making things work

47 In a hydraulic brake, the pressure in the liquid is transmitted in which direction?

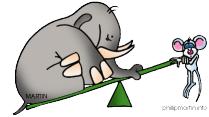
In all directions



Making things work

48 What unit is usually used when calculating pressure?

Pa (Pascal)



Making things work

49 If a rider applies a larger force to the brake lever, how would this increase in force affect the pressure in the brake fluid?

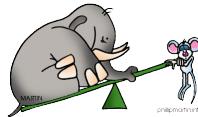
It increases



Making things work

50 A hydraulic jack is an example of what?

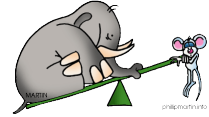
A force multiplier



Making things work

51 Explain how the wheel of the London eye can move at a steady speed and the capsules accelerate at the same time.

Acceleration occurs when the direction changes. As velocity has direction, acceleration, which is the rate of change in velocity, changes.



Making things work

52 What is the name of the resultant force that causes the capsules of the London eye to accelerate as the wheel moves at a steady speed?

Centripetal force



Magnetic fields

53 An electric motor produces a turning force. Give two ways in which to increase the turning force.

Increase the current/increase the number of turns on the coil/increase the area of the coil/increase the strength of the magnetic field



Magnetic fields

54 Which appliances have an electric motor: electric drill, electric kettle, electric fan, electric iron, electric food mixer and electric screwdriver?

electric drill, electric fan, electric food mixer and electric screwdriver



Magnetic fields

55 Give two ways of reversing the direction of the forces on a coil in an electric motor.

Reverse the direction of the current or the direction of the magnetic field.



Magnetic fields

56 In what circumstance will no force act on a conductor carrying an electric current in a magnetic field?

When the conductor is parallel to the magnetic field or the lines of magnetic force and path of electricity do not cross.



Magnetic fields

57 Why is the core of a transformer made of iron?

It is easily magnetised.



Magnetic fields

58 Give two advantages of having a National Grid system.

Fewer power stations are needed; electricity can be generated remote from customers; power is available in remote areas; better control of demand and supply



Magnetic fields

59 What does a step down transformer do?

It decreases the p.d.



Magnetic fields

60 Give one advantage of using a switch mode transformer, rather than a traditional transformer inside mobile phone chargers.

Lighter, smaller, uses little power, more efficient



Magnetic fields

61 Why must a mains adapter contain a transformer?

To reduce the mains p.d.



Magnetic fields

62 Describe what happens when an alternating potential difference is applied across the primary coil of a transformer.

The alternating p.d. in the primary coil causes an alternating field in the iron core which induces alternating p.d. across the secondary coil.



Magnetic fields

63 Why are the primary and secondary coils of a transformer made of insulated wire?

So that there is no short circuit and the current does not enter the core.

