P1 - Waves Quiz

1. List the EM waves from longest to shortest wave length.

   Radio, micro, IR, visible, UV, X-Ray, gamma

2. State one difference between UV and visible light.

   UV has a higher frequency, shorter wavelength

3. What does redshift tell scientists about galaxies?

   That they are moving away from Earth

4. Why is the redshift not the same for all galaxies?

   Galaxies are moving away from Earth at different speeds

5. What does redshift suggest about the Universe?

   That it is expanding

6. What happens when a metal aerial absorbs radio waves?

   It creates an alternating current with the same frequency as the radio wave

7. Why would an X-ray telescope placed on Earth not be able to detect X-rays emitted from distance stars?

   X-rays cannot penetrate the atmosphere

8. Give an example of IR being used for communication.

   TV, remote controls, optical fibres, remote control, thermal imaging

9. Give the difference between transverse and longitudinal waves.

   Oscillations are perpendicular to the direction of energy transferred for transverse waves but parallel for longitudinal waves

10. Why can you hear but not see the TV in another room?

    Light waves will not diffract but sound waves will because the width of the door is similar to the wavelength of the sound wave.

11. Why do thermal imaging cameras work better at night than during the day?

    At night the surroundings are cooler so they emit less IR than a person; the difference in IR emitted is larger

12. Give two properties of all EM waves.

    Travel at the same speed, transfer energy, travel through a vacuum, can be reflected, refracted, diffracted, absorbed, are transverse, travel in straight lines

13. What is the property of microwaves that allows them to be used for satellite communications?

    They can pass through the ionosphere.

14. An image in the mirror is virtual. Why?

    Image is formed by imaginary rays crossing; formed behind the mirror

15. If microwaves are absorbed by a tennis ball, what effect do the microwaves have on the ball?

    Make it hotter

16. How does red shift provide evidence for the Big Bang theory?

    Redshift of distant galaxies is greater which means that the further apart galaxies are the faster they are moving away from each other; relationship is proportional, so must have started at same point.

17. Compare a quiet and low pitch sound to a loud and high pitch sound.

    Low pitch has longer wavelength and lower frequency/ Quieter sound has lower amplitude

18. What is cosmic background radiation?

    Microwave noise that reaches Earth from many stars and galaxies; radiation created just after the Big Bang

19. How do you calculate wave speed?

Wave speed (m/s) = frequency (Hz) x wavelength (m)

20. Describe the Big Bang theory.

Universe started in one place; huge explosion took place and sent matter outwards; Universe has been expanding ever since.

21. What is the Universe?

An innumerable collection of galaxies

22. What is redshift?

Light moves towards the red end of the spectrum

23. Describe how the sound changes when a car drives past you.

Car drives towards you: wavelength shortens and frequency increases Car drives away from you: wavelength lengthens and frequency decreases

24. Why do scientists use X-ray, gamma ray and microwave telescopes to observe the Universe?

Stars emit different types of EM radiation

25. How is the wavelength of CMBR likely to change over the next billion years?

Increase as Universe continues to expand

26. What is the Doppler Effect?

Change in wavelength and frequency when the source of waves or observer moves (Relative to each other)

27. Give one example of microwaves being used for communications.

Mobile phone/satellite communications

28. What are the dangers of IR, UV and micro wave radiation?

IR- skin burns, UV- skin burns, skin cancer Microwaves - burns, cancer

29. Give a use of radio waves.

TV broadcasting, mobile phone communications

30. Describe an image formed in the mirror.

Virtual and upright, same distance behind the mirror as object is in front of the mirror

31. What is refraction?

When light travels from one medium to another, it changes direction because it's speed has changed; this is due to the density of the medium having changed

32. What are sound waves caused by?

Vibrations

33. How can you reduce the amount of noise transmitted through walls? Why does the method work?

Panel the walls with wood or plaster or similar so the sound is reflected back or absorbed

34. What is diffraction?

The spreading of waves when they pass through a gap or around the edges of an obstacle which has a similar size as the wavelength of the wave

35. How do microwaves heat food?

Microwaves are absorbed by the water inside the food, the water heats the food

36. What does the term frequency mean?

Number of waves per second

37. What do the words compression and rarefaction mean?

Compression is squeezing together, rarefaction is stretching apart

38. Why does the mirror get misty when you have a hot shower?

Water evaporates and goes into the air, mirror is colder than the air, water particles hit mirror and lose energy, and condensation is caused

39. How does a vacuum flask keep the liquid inside hot?

Plastic cap is poor conductor & stops evaporation of hot liquid as particles cannot escape; stops convection currents so no heat loss by convection; vacuum prevents heat loss by conduction & convection as both require particles; silver lining to reflect IR back inside the flask and reduce heat loss by radiation

40. Why do arctic foxes have small ears?

Ears have a small surface area so reduce heat loss

41. What is the law of reflection?

Angle of incidence = angle of reflection

42. Why is foam a good insulator?

Air cannot circulate inside foam as the air bubbles are trapped inside the foam

43. What is meant by the term U-value?

How effective an insulator a material is; the lower the U-value, the better the material is at insulating

44. What is geothermal energy?

Energy from hot rocks in the Earth

45. Why does the National Grid include step-up transformers?

To increase the voltage across the cables and reduce energy loss

46. Why are copper pipes inside a solar panel painted black?

Black is a good absorber of radiation so there will be a faster transfer of energy to the water

47. Why is electricity essential for modern communication and public health?

    Many devices transform one type of energy into others; doctors and hospitals can store vaccines and blood in refrigerators; internet runs on electricity

48. What is the role of the step-down transformer?

    It reduces the voltage to a safe working value for homes and offices

49. What are the two main pieces of evidence for the Big Bang theory?

    Redshift and cosmic microwave background radiation