PRELIMINARY PHYSICS REVISION

PAPER 1

PART A

1. B	2. A	3. D	4. D	5. C
6. A	7. C	8. C	9. B	10. A
11. B	12. D	13. D	14. A	15. D

PART B

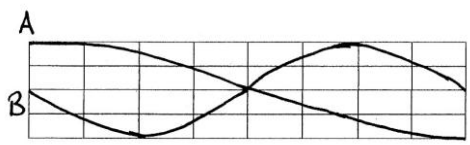
16.

(a) The other station is far away so that the intensity of the signal is too weak to be picked up by the radio receiver (Inverse square law)

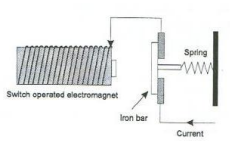
(b) AM (Amplitude Modulation): the signal wave is added to the carrier wave by superposition of their amplitudes

There is a change to FM because AM is more likely subjected to interference by outside disturbances than FM

17.



18.



A circuit breaker (like a fuse) is used to disconnect the electrical circuit in a house when the current exceeds a given limit. It consists of an electromagnet made of a coil. As the current gets stronger the electromagnetic force becomes very powerful and can pull a metal piece, which connects the circuit. The circuit without the metal piece is incomplete hence is disconnected. To work the circuit again, the external switch only needs to be flicked to return the metal piece back to its original position and the circuit will connect.

The use of a circuit breaker is quite fast and is more convenient than a fuse as a replacement of the device is not necessary after it is activated.

19. a) I (3 Ω) = 0.20 A V(3 Ω) = 0.6 V
I (5 Ω) = 0.6 ÷ 5 = 0.12 A

Total current through 10 Ω = 0.20 + 0.12 = **0.32 A**

b) V (3 Ω) = 0.6 V
V (10 Ω) = 3.2 V
V (2 Ω) = 0.64 V
Total Voltage = **4.44 V**

20.

a) Infra-red
b) Microwaves
c) X-rays
d) Visible light

21.

a) $\Delta KE = \frac{1}{2} mv^2 - \frac{1}{2} mu^2 = 32\ 500$

$v = 18.26\ ms^{-1}$

b) $v = u + at$ hence $a = 2.173\ ms^{-2}$

The net force $F = ma = 600 \times 2.172 =$ **1304 N**

22.

- White dwarf:

  No more production of energy due to the ceasing of nuclear fusion.

- Main sequence:

  Energy source is due to the nuclear fusion of hydrogen.

23.

The Sun would have greater surface temperature than the star on the far right of the main sequence because as the star moves from the right to the left of the main sequence, it gains more mass due to gravitational attraction. As the mass of the star increases, the gravitational force increases. To counteract the increasing in the gravitational force, the star becomes more luminous (ie: rate of nuclear fusion increases) hence greater surface temperature.

24.

The statement can be justified using the discovery of the expansion of the universe as an example.

Prior to the discovery of the expansion of the Universe, Einstein hypothesized that the Universe is static, despite his general theory of relativity predicted that the Universe is not static but changing.

After Einstein, Freidmann hypothesized that the universe is expanding by using theoretical mathematics.

Following the prediction by Einstein and Friedmann, Edwin Hubble, an American astronomer, discovered the many galaxies made up the Universe and the red shift. Evidences from the red shift showed that the Universe is expanding.

This evidence supported Freidmann's hypothesis on the expanding nature of the universe.

25.

Sunspots are dark, cool areas on the sun's surface with a very powerful magnetic field. The number of sunspots varies with a period of 11 years. When the sunspot cycle is at its peak about 100 sunspots are visible, and when the cycle is at its minimum only a few sunspots are visible at anyone time.

It was found that when the sunspots are at its peak, solar flares are produced. A solar flare is an explosion of hot material that bursts thousands of kilometres upwards from the surface of the Sun. Solar flares can emit huge amounts of X-rays, UV and visible radiation as well as bursts of high-speed protons and electrons.

The high speed charged particles (ie: protons and electrons) reach the Earth as powerful blasts of solar wind known as magnetic storm. Such blasts can damage satellites and its communication. The blasts also affect the Earth's magnetic field, causing compasses to malfunction and producing large induced current which can disrupt the power grid on the Earth.

26.

Type of radiation	Identity	Penetrating power	Ionising power
Alpha	Helium nucleus	Low	High
Beta	High speed electrons	Moderate	Moderate
Gamma	Electromagnetic wave	High	Low

27. STELLAR EVOLUTION

▪A molecular cloud that is sufficiently cool and massive will contract under its own gravity. It begins slowly but, as it draws itself in, the gravitational freefall speeds up. The density increases more quickly at its centre forming the core.

▪As the core contracts, the gravitational potential energy of its gas particles is lost and converted to heat energy: a protostar is formed. As more gravitational collapse occurs in the protostar, the core may reach a temperature high enough to trigger the nuclear fusion of the hydrogen within it. This is now a zero-age main sequence star

▪When the hydrogen fuel is running out, the gravitational attraction exceeds the radiation pressure. The star starts to collapse into its core.

If the original mass of the main-sequence star is small , the rise in temperature of the core is not sufficient trigger a fusion of helium. This becomes a white dwarf. The white dwarf eventually becomes a black dwarf.

▪If the original mass of the star is large enough, the gravitational collapse triggers the nuclear fusion of helium at the core. This forms a red giant.

▪When the red giant runs out of helium, it will collapse, giving out much energy. This is a NOVA. In some massive red giants (super red giants), tremendous amount of energy is released as the result of gravitational collapse. This results in an explosion known as Supernova.

▪In a nova, a planetary is formed leaving behind a white dwarf.

In a supernova, depends on the remaining mass of the core, the core may end in a white dwarf, a neutron star or a black hole.