**Name of the Student**:_____
**Max. Marks : 17 Marks** **Time : 17 Minutes**

Mark Schemes

## Q1.

(a) Gives the ratio of the (recessional) velocity (of galaxies) to distance from Earth

*Accept equation with terms defined*
*not*
*v depends on d,*
*the relationship between them, shows the relationship between them*

B1
**1**

(b) *d* changed to Mpc ($2.45 \times 10^{2}$)
or $1.8 \times 10^{4}$ / their attempt to convert distance
*Or d change to m and v to m s$^{-1}$*

B1

(*H*=) 73.35 or 73.47 seen to at least 3 sf

B1
**2**

(c) (i) $T = 1 / H$ or $H = 2.4 \times 10^{-18}$ s seen
*e.g. $3.08 \times 10^{-19}$ / 73*

C1

Value in s calculated ($4.2 \times 10^{17}$)

A1

Correct conversion to years $1.3 \times 10^{10}$
*Allow their value in s*

B1
**3**

(ii) Universe is expanding at constant / steady rate

B1
**1**

**[7]**

**Q2.**

(a) Apparent magnitude at a distance of 10pc

*Allow "brightness".*
*Do not allow luminosity or magnitude.*

**1**

(b) Absolute magnitude from 15 to -10
Temperature from 50 000K to 2500K

*Allow 15 to -15.*
*Allow 50 000 to 3500 K.*

**2**

(c) (i) S at 5700 K and abs mag 5

*The position of S should be consistent with the scales on the axes.*
*Allow ce on scale.*
*Allow 6000 for T.*
*If labels not present, or if only correct extreme values on scale, S should be to the right of and below the centre.*

**1**

(ii) W at same abs mag as S, but further to left

*Judgements on ii – iv should be based on the position of S. If S is not labelled, it should be based on where S should be.*

**1**

(iii) X at same temperature as S but greater absolute magnitude

**1**

(iv) Y at same abs mag or above S, on the right hand side of the diagram

**1**

(d) Similar power output ✓
but is hotter ✓
Ref to $P = \sigma AT^4$ hence W must have smaller diameter than the Sun ✓

*Allow luminosity for Power.*
*Answer must be supported to get the mark.*

**3**

**[10]**